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THE FAUNA OF BRITISH INDIA,

INCLUDING

CEYLON AND BURMA.

Published under the authority of the Secretary of State for India in Council.

EDITED BY W. T. BLANFORD.

MAMMALIA.

BY

W. T. BLANFORD, F.R.S.

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INTRODUCTION.

The present is the first part of a general work, compiled for the Government, and published under its authority, on the Fauna of British India and its dependencies. A few details respecting this larger work may serve as a preface to the introductory observations on the Mammalia.

The large additions made to our knowledge of Indian Zoology during the period, now about a quarter of a century, that has elapsed since the appearance of Jerdon's 'Birds' and 'Mammals' and Günther's 'Reptiles' have for some time rendered it desirable that a new series of descriptive manuals should be prepared. The Secretary of State for India in Council, upon the recommendation of the Government of India, gave his sanction, in 1883, to a plan for the preparation of the works most urgently required, and entrusted the editorship of the series to the present writer. From various causes the appearance of the work has been delayed, but it is hoped that the principal difficulties have now been overcome.

For the present, it is proposed to restrict the publication to the Vertebrata, and to complete the work in seven volumes of about 500 pages each. One of these volumes will contain the Mammals (the present issue is only a half-volume), three will be required for the Birds, one for Reptiles and Batrachians, and two for Fishes.

The authorship of the volumes on Fishes has been undertaken by Mr. F. Day, C.I.E., Deputy Surgeon-General, author of the 'Fishes of India'; the Reptilia and Batrachia will be described by Mr. G. A. Boulenger, author of the recently published British-Museum Catalogues of Batrachia and Lizards; whilst the Birds will, it is hoped, be taken in hand by Mr. E. W. Oates, author of the 'Birds of British Burmah.' The Mammals remain to be

described by the Editor. The greater part of the second half-volume on Mammalia is written, and much progress has been made with all other parts of the work, so that there is every prospect of the whole being issued in the course of the next few years.

The limits adopted for the fauna are those of the dependencies of India, with the addition of Ceylon, which, although British, is not under the Indian Government. Within the limits thus defined are comprised all India proper and the Himalayas, the Punjab, Sind, Baluchistan, all the Kashmir territories, with Gilgit, Ladák, &c., Nepal, Sikhim, Bhutan, and other Cis-Himalayan States, Assam, the countries between Assam and Burma, such as the Khási and Naga hills and Manipur, the whole of Burma, with Karennee and, of course, Tenasserim and the Mergui Archipelago, and, lastly, the Andaman and Nicobar Islands. Afghanistan, Kashgaria, Tibet, Yunnan, Siam, and the Malay Peninsula south of Tenasserim are excluded. A few States, such as Nepal and Bhutan, at present not accessible to Europeans, are comprised, because it would be difficult to leave them out; scarcely an animal occurs in either not found also in British territories or in protected States, such as Sikhim.

The whole of India and its dependencies, with the exception of the higher Himalayas and Trans-Himalayan tracts, is included in the Oriental Region, one of the six great zoological regions* into which the terrestrial surface of the globe was divided by Sclater, whose views have been adopted by Wallace and others. Several Ethiopian and Palæarctic genera are intermixed with forms characteristic of the Oriental Region in North-western India, and some of these forms range throughout the Peninsula, but not further to the eastward.

The division of the area into zoological subregions is somewhat difficult, the affinities of the different subdivisions being compli-

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* These six zoological regions are the following:—

I. *Palæarctic*: Europe, Africa north of the Sahara, and Asia north of the Himalayas.

II. *Ethiopian*: Africa south of the Sahara.

III. *Oriental*: India and South-eastern Asia, with the Malay Archipelago, as far east as Java, Bali, Borneo, and the Philippines.

IV. *Australian*: Australia, Celebes, New Guinea, New Zealand, and the islands of the Pacific.

V. *Nearctic*: America north of the Tropic of Cancer.

VI. *Neotropical*: Central and South America.

For further particulars, see Wallace's 'Geographical Distribution of Animals.'

cated. The following subregions may be accepted as convenient and as approximately correct:—

I. *Tibetan.* The Upper Indus valley (Gilgit, Ladák, &c.) and the higher Himalaya above 12,000 or 14,000 feet.

II. *Himalayan.* The southern slopes of the Himalaya, from the base to about the limit of trees.

III. *Indian.* India from the base of the Himalaya to Cape Comorin, with the exception of the Malabar coast, but with the addition of Northern Ceylon.

IV. *Malabar or Ceylonese.* The Malabar coast and the neighbouring hills as far north as the Tapti river, together with Southern Ceylon.

V. *Burmese.* All Burma except South Tenasserim, and with the addition of Assam and the intervening countries.

VI. *South Tenasserim.* This is the northern extremity of the great Indo-Malayan subregion, comprising the Malay Peninsula and several of the islands.

Some of these may require further subdivision. Thus the fauna of the North-west Provinces and Punjab differs considerably from that of Southern India, and both areas exhibit zoological distinctions from the forest-clad tracts of South-western Bengal. There is also much difference between the animals of Pegu and Arakan, on the one hand, and those of the drier regions of Upper Burma on the other; and even greater distinctions may be traced between those found in the subtropical and those inhabiting the temperate regions of the Himalaya. On the other hand, the subtropical Himalayas were united with the Burmese subregion by Wallace, and the two are, perhaps, zoologically more allied to each other than to any other subregion.

It is well to notice that the Tibetan subregion is Palæarctic, whilst the other five subdivisions are included in the Oriental Region.

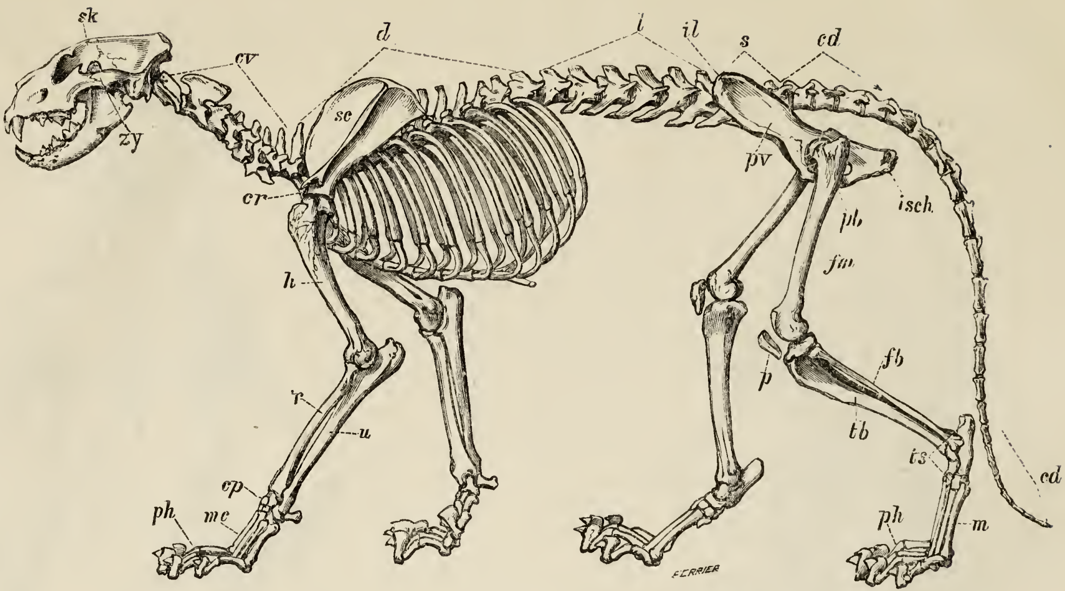
The preceding remarks apply to the 'Fauna of British India' in general; the following relate to the present volume. The classification of Mammals here adopted was proposed by Professor Flower in the Proceedings of the Zoological Society of London for 1883, pp. 178–186. The arrangement is but slightly modified from that employed by the same author in the last (ninth) edition of the 'Encyclopædia Britannica' (Article "Mammalia"). Although this classification is, so far as I am able to judge, the best hitherto published, there are, as will be mentioned in the

proper places, several questions on which wide differences of opinion exist. Thus many excellent naturalists regard as of ordinal rank subdivisions such as, for instance, the *Lemuroidea* and *Proboscidea*, classed by Professor Flower as suborders.

The descriptions of the genera and species in the following pages have been taken from specimens, whenever any were accessible; in the few cases in which, for want of available specimens, the characters are copied from descriptions by previous writers, the fact is stated. The measurements are taken from various sources, and, whenever possible, dimensions of freshly-killed animals, or, in the case of the smaller forms, of perfect examples preserved in spirit, have been selected. The length of the head and body from the tip of the nose to the insertion of the tail and the length of the tail are naturally of little value when taken from skins; these two dimensions are given, when possible, in the following pages, the tail measurement being without the hair, if data are available. Other measurements often cited are those of the ear, usually from the crown of the head, sometimes from the external base or from the orifice, and of the pes or hind foot, including the tarsus, from the joint corresponding to the heel in man and the hock in a horse to the end of the longest toe, the claws not being included, unless their inclusion is specified. In particular cases other dimensions are added, for instance the forearm in bats.

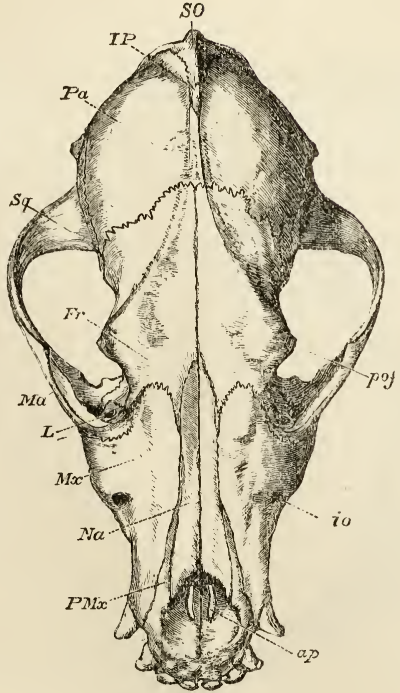
Two measurements of the skull are generally given:—the basal length, from the anterior or lower margin of the foramen magnum to the anterior border of the premaxillaries, the incisor teeth not being included; and the zygomatic breadth, across the widest part of the zygomatic arches. The extreme length of the skull sometimes recorded is either from the posterior surface or from the supraoccipital to the end of the premaxillaries, or, in some skulls, to the end of the nasals.

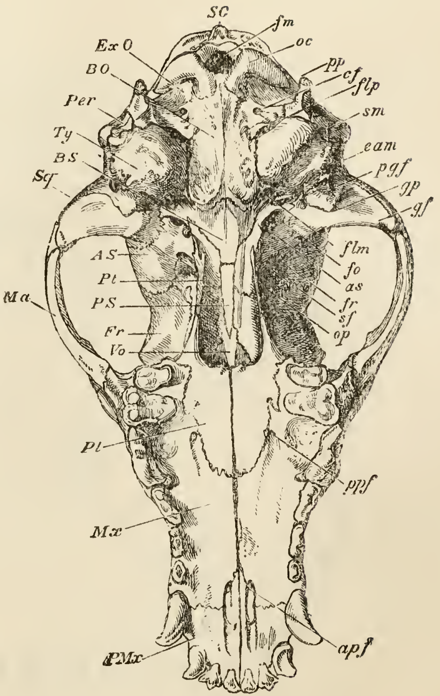
The notes on distribution and habits are compiled from various writers, especially from the works of Jerdon, Blyth, Hodgson (inclusive of the MS. notes on his drawings in the Zoological Society's library), Elliot, Kelaart, Tickell (also including his MS. notes), Sterndale, McMaster, Forsyth, Sanderson, and others, supplemented by my own observations during a residence of more than 20 years in India, in the course of which time, whilst employed in the Geological Survey of the country, I visited many parts of India and Burma, and became acquainted with most of the wild animals in their native haunts.



Skeleton of a Lioness. (From Guide to the Galleries of Mammalia, British Museum.)

cd, caudal vertebræ; *cp*, carpus; *cr*, coracoid; *cv*, cervical vertebræ; *d*, dorsal vertebræ; *fb*, fibula; *fm*, femur; *h*, humerus; *il*, ilium; *isch*, ischium; *l*, lumbar vertebræ; *m*, metatarsus; *mc*, metacarpus; *p*, patella; *pb*, pubis; *ph*, phalanges; *pv*, pelvis; *r*, radius; *s*, sacral vertebræ; *sc*, scapula; *sk*, skull; *tb*, tibia; *ts*, tarsus; *u*, ulna; *zy*, zygomatic arch.





Upper and under surface of a Dog's cranium. (Flower's 'Introduction to the Osteology of the Mammalia,' figs. 46, 47.)

ap, *apf*, anterior palatine foramen; *AS*, alisphenoid; *as*, posterior opening of alisphenoid canal; *BO*, basioccipital; *BS*, basisphenoid; *cf*, condylar foramen; *eam*, external auditory meatus; *ExO*, exoccipital; *flm*, foramen lacerum medium; *flp*, foramen lacerum posterius; *fm*, foramen magnum; *fo*, foramen ovale: *Fr*, frontal; *fr*, foramen rotundum and anterior opening of alisphenoid canal; *gf*, glenoid fossa; *gp*, postglenoid process; *io*, infraorbital foramen; *IP*, interparietal; *L*, lachrymal; *Ma*, malar or jugal; *Mx*, maxilla: *Na*, nasal; *oc*, occipital condyle; *op*, optic foramen; *Pa*, parietal; *Per*, mastoid portion of periotic; *pgf*, postglenoid foramen; *Pl*, palatine; *PMx*, premaxilla; *pof*, postorbital process of frontal bone; *pp*, paroccipital process; *ppf*, posterior palatine foramen; *PS*, presphenoid: *Pt*, pterygoid (the mesopterygoid fossa is the hollow between the two pterygoid bones); *sf*, sphenoidal fissure or foramen lacerum anterius; *sm*, stylo-mastoid foramen; *SO*, supra-occipital; *Sq*, squamosal and its zygomatic process; *Ty*, tympanic or auditory bulla; *Vo*, vomer.

The synonymy has been thoroughly revised, the original descriptions having been consulted in every case. A list of the principal works quoted, with their abbreviated titles, is appended. The British-Museum catalogues by Dr. Gray are referred to as seldom as possible, because of their inaccuracy. A considerable proportion of the mistakes made by Indian naturalists, in nomenclature especially, may be traced to these catalogues.

Space does not permit the addition of a sketch of mammalian anatomy. The accompanying woodcuts of a lion's skeleton and of a dog's skull will suffice to show the names and position of the principal bones. For further details with regard to the skeleton the student will do well to consult Flower's 'Introduction to the Osteology of the Mammalia,' from which, by permission of the author and publishers, the woodcuts of a dog's skull are taken. For the anatomy of the soft parts no similar compendium exists; a sketch will be found in the article "Mammalia" in the 'Encyclopædia Britannica,' but a general work on mammalian anatomy is still wanted. The teeth have been treated in separate works by Owen, Giebel, and others. Here it is only necessary to say that they are divided into incisors, canines, premolars, and molars; that the three first-named are, as a rule, preceded in the young mammal by milk or deciduous teeth; that the upper canine is the tooth behind the premaxillary suture or in contact with it, and the lower canine the tooth that, when the jaws are closed, comes immediately in front of the upper canine; the teeth in front of the canines are incisors, those behind premolars and molars.

It will be difficult within the limited space available for me to acknowledge the assistance of all who have aided me in preparing the present work. I am indebted particularly to General R. Strachey and Col. Yule, and equally so to Professor Flower and Dr. Günther for aid most liberally given on all occasions, also to Mr. P. L. Sclater, Dr. J. Anderson, Sir J. Fayrer, Prof. A. Newton, Mr. A. Hume, Prof. Mivart, Mr. J. Scully, Sir O. B. St. John, Col. J. Biddulph, Mr. Davison, Captain Bingham, Mr. W. Daly, Rev. S. Fairbank, Mr. Wood Mason, Mr. W. L. Sclater, Mr. H. E. Watson, the late Mr. L. Mandelli, and Mr. J. Murray, for assistance of various kinds. Above all I am under obligations to Mr. G. E. Dobson and Mr. Oldfield Thomas, not merely for the great extent to which this work has been facilitated by their writings, but also for advice and information of many kinds and on numerous occasions. But for Mr. Dobson's researches amongst the Chiroptera and Insectivora, the labour of preparing a work on Indian Mammalia would have been greater by at least one third.

I have also to acknowledge with gratitude the permission liberally granted to me by the Trustees of the British Museum, the Zoological Society, Messrs. Macmillan and Co., and Messrs. Black and Co., of Edinburgh, to publish copies of woodcuts taken from their publications. The work from which the cut is taken is quoted in each case. Several of the illustrations are, by permission of the Zoological Society, taken from drawings by the late Col. Tickell, and from the superb collection made by Mr. B. H. Hodgson, both of which series are now in the Society's Library. The majority of the cuts are copied, from drawings by Mr. R. E. Holding and Mr. P. J. Smit, by the Typographic Etching Company's process.

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MAMMALIA.

Mammals are warm-blooded Vertebrate animals that nourish their young with milk secreted by the females in glands situated in pairs on the under surface of the body. All, with a very few exceptions (chiefly *Cetacea*), are covered with hair. The great majority possess teeth, and the higher forms are heterodont, or furnished with teeth of different kinds, and diphyodont, or bearing two sets—the first, known as milk or deciduous teeth, generally coming into use at birth or soon after, and being subsequently replaced by a second or permanent set. Most mammals possess two pairs of limbs like other normal vertebrates, and the terminal extremities of these limbs, with but few exceptions, are furnished with nails, claws, or hoofs. The thoracic cavity, containing the lungs, is completely separated by the diaphragm from the abdomen.

The class Mammalia is divided into the following *subclasses* :—

A. Oviparous, both genito-urinary passage and anus opening into a cloaca.

I. **PROTOTHERIA, Ornithodelphia** or **Monotremata.**

B. Viviparous, genito-urinary orifice external and distinct from anal *.

a. No allantoid placenta †.

II. **METATHERIA, Didelphia** or **Marsupialia.**

b. An allantoid placenta.

III. **EUTHERIA, Monodelphia** or **Placentalia.**

Of the subclasses the *Prototheria* or *Monotremata* are peculiar to the Australian region, whilst the *Metatheria* or *Marsupialia* are only found in the same region and in America (chiefly in South America). The *Eutheria* or *Placentalia* comprise, according to Professor Flower's latest classification, nine orders, all represented in India. These orders may be distinguished (so far, at all events, as Indian genera are concerned) by the characters shown in the

* The two open on a common outlet in some genera of *Insectivora*.

† For full details as to the significance of these characters in classification, consult Huxley's 'Introduction to the Classification of Animals,' p. 87, or Balfour's 'Comparative Embryology,' vol. ii. p. 176, or 'Encyclopædia Britannica,' article "Mammalia," pp. 369, 371, &c.

following table: these characters are not always those of the greatest importance, but only those most easily recognized:—

Subclass EUTHERIA.

A. Posterior limbs present.
- *a.* Animal not modified for flight.
  - *a'.* Incisors present in one or both jaws.
    - *a''.* Incisors in front of the upper and lower jaw, either not two in number or not chisel-shaped.
      - *a³.* Feet terminating in distinct toes with claws or nails.
        - *a⁴.* Hallux or pollex or both opposable to other digits . . . . 1. *PRIMATES.*
        - *b⁴.* Neither hallux nor pollex opposable.
          - *aa.* Upper lip in general not projecting far beyond lower; median pair smaller than other incisors . . . . 2. *CARNIVORA.*
          - *bb.* Snout very pointed; upper lip projecting far beyond lower; median pair of incisors generally larger than the others . . . . 3. *INSECTIVORA.*
      - *b³.* Feet either not terminating in distinct toes or furnished with hoofs or hoof-shaped nails . . . . 6. *UNGULATA.*
    - *b''.* Two chisel-shaped incisors in front of each jaw . . . . 5. *RODENTIA.*
  - *b'.* No incisors, except in certain Armadillos; Indian forms toothless . . . . 9. *EDENTATA.*
- *b.* Animal modified for flight; fingers enormously developed to support a membranous wing . . . . 4. *CHIROPTERA.*

B. No external posterior limbs; body modified for swimming.
- *a.* Homodont or toothless: breathing-orifice generally on top of head; a back fin in most genera; mammæ inguinal . . . . 7. *CETACEA.*
- *b.* Indian form heterodont: breathing-orifice at end of muzzle; no back fin; mammæ pectoral . . . . 8. *SIRENIA.*

Order PRIMATES.

This Order comprises Man, Monkeys, and Lemurs, and therefore includes the most highly organized Mammalia. At the same time the Lemurs and some of the Monkeys are of comparatively low grade, and much inferior, at all events in development of brain, to Mammalia belonging to other orders.

The dentition throughout the order is heterodont (comprising incisors, canines, premolars, and molars) and diphyodont. There is a bony ring to the orbit, the clavicles are well developed, and the radius and ulna are distinct. There are usually 5 unguiculate digits to both the manus and pes, but the pollex may be rudimentary or wanting. Either the pollex (thumb) or hallux (great toe) or both are opposable.

The members of this division are almost without exception arboreal.

The Primates are divided into two suborders. Many naturalists class the Lemurs as a distinct order, for reasons that will be noticed under *Lemuroidea*.

The suborders are thus distinguished :—

A. Orbit completely enclosed by bone behind. Pollex (or thumb) short (wanting in a few instances); second digit of foot with a nail similar to those of other digits. Upper incisors not divided by a space in the middle . . ANTHROPOIDEA.

B. Orbit opening behind into temporal fossa beneath the postorbital arch. Pollex long, second digit with a long claw. Upper incisors (except in *Chiromys*) divided by a space in the middle .... LEMUROIDEA.

Suborder *ANTHROPOIDEA*.

A. Premolars $\frac{2}{2}$, molars $\frac{3}{3}$; thumb, if present, opposable; internasal septum narrow. (*Catarrhini.*)

I. No tail; stature erect; great toe or hallux parallel with other toes, not opposable; arm shorter than leg; no interval between upper canines and incisors; canines not longer than incisors .... **Hominidæ.**

II. No tail; stature sometimes erect, sometimes not; hallux opposable; arm longer than leg; an interval between upper canines and incisors; canines in adults longer than incisors .... **Simiidæ.**

III. A tail almost always present; stature never erect; hallux opposable; arm not longer than leg; an interval between upper canines and incisors; canines in adults longer than incisors .... **Cercopithecidæ.**

B. Premolars $\frac{3}{3}$, molars $\frac{2}{2}$ or $\frac{3}{3}$; thumb not opposable; hallux always opposable; internasal septum broad. (*Platyrrhini*, all American.)

IV. M. $\frac{3}{3}$; tail in many cases prehensile .... **Cebidæ.**

V. M. $\frac{2}{2}$; tail not prehensile .... **Hapalidæ.**

The family *Hominidæ* comprises but one genus, and, according to the views usually accepted, but one species, Man. Naturalists have differed as to the physical relations of Man to other animals, but most modern writers have returned to the views of Linnæus, and class Man with the Monkeys, but in a distinct family*. No attempt will be made in the present work to enter into the anthropology of India; the subject requires a volume to itself.

The *Cebidæ* and *Hapalidæ* are confined to America. Representatives of the *Simiidæ* and *Cercopithecidæ* are found within the Indian area.

Family SIMIIDÆ.

The *Simiidæ*, or anthropoid Apes, comprise the Gorilla, Chimpanzee, Orang-outang, and Gibbons. The first two are peculiar to Africa, the Orang-outang inhabits Sumatra and Borneo, whilst the Gibbons, forming the genus *Hylobates*, are found throughout South-eastern Asia and some of the neighbouring islands, but not west of the Bay of Bengal. They are the only members of the family occurring within our area.

In Pliocene times, however, it is probable that two large anthropoid Apes inhabited Northern India. One of these, *Troglodytes sivalensis*, was allied to the Chimpanzee, whilst a canine tooth indicates a form very closely approaching the Orang-outang. Remains of both have been found in the Siwalik beds of the Punjab.

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* On this subject the following works may be consulted:—Darwin, 'The Descent of Man;' Huxley, 'Man's Place in Nature;' Mivart, under the article "Ape," and Flower, under "Mammalia," in the 'Encyclopædia Britannica,' 9th edit.

Genus **HYLOBATES**, Illiger (1811).

Size smaller than that of other anthropoid Apes; the largest species, *H. syndactylus*, not much exceeding three feet in height. Body and limbs slender; arms, hands, and feet exceedingly long, the arms being so much longer than the legs that the hands reach the ground when these animals stand upright on their feet—a position that is assumed habitually by this genus, and by this alone, amongst the *Simiidæ*, when walking. Thumb and great toe deeply separated from the next digits. Ischial callosities (naked thickened

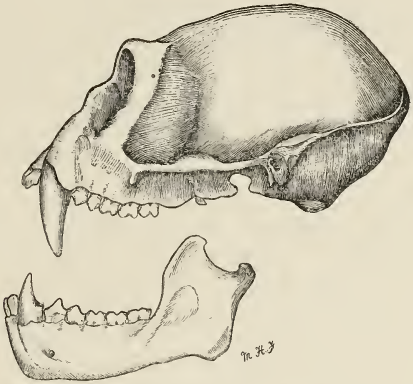

Fig. 1.—Skull of *Hylobates lar*.

skin on each buttock) present, but small. There are generally 13 pairs of ribs, 5 lumbar, 3 sacral, and 3 or 4 caudal (coccygeal) vertebræ; so that there being, as usual, 7 cervical vertebræ, the vertebral formula is C. 7, D. 13, L. 5, S. 3, C. 3–4.

Dentition: i. $\frac{4}{4}$, c. $\frac{1-1}{1-1}$, pm. $\frac{2-2}{2-2}$, m. $\frac{3-3}{3-3}$.

Synopsis of Indian and Burmese Species.

A white or grey band across the eyebrows, remainder of head and upper surface of feet and hands the same colour as the body	*H. hoolock*, p. 5.
Hands, feet, and a ring of hair surrounding the face white or whitish	*H. lar*, p. 7.

1. **Hylobates hoolock.** *The Hoolock* or *white-browed Gibbon.*

Simia hoolock, *Harlan, Trans. Am. Phil. Soc.* iv, p. 52, pl. 2 (1834).
Hylobates hoolock, *Blyth, Cat.* p. 4; *Sclater, P. Z. S.* 1870, pl. v, fig. 2; *Blyth, Mam. Birds Burma*, p. 1; *Anderson, An. Zool. Res.* p. 1; *id. Cat.* p. 26.

Uluk, Hindi; *Myouk-lwai-gyau* and *Tuboung*, Burmese of Arakan.

Colour. Generally black throughout, with the exception of a white or grey band across the eyebrows. This band is usually, but not always, interrupted in the middle. Many individuals, however, both males and females, vary in colour from brownish black to light yellowish grey, the frontal band being always conspicuously paler. The crown, back, and outside of the limbs are often paler-coloured than the lower parts of the body, the skin of the naked part of the face below the frontal band being almost always dark-coloured. Blyth thought that the males only were black, the females always paler; but this is certainly not the case; the females, however, are more frequently pale-coloured than the males.

Dimensions. From crown to rump about 20 inches, fore limb (including hand) 23, hand alone 6, leg and foot 19, foot 6; height from crown to heel about 32 inches. An adult male skull is 4·45 inches long from the occiput to the alveolar margin of the premaxillaries at the base of the middle upper incisors, 3·35 in basal length from the lower or anterior edge of the foramen magnum to the same, and 2·9 in breadth across the widest part of the zygomatic arches.

Distribution. The hill-ranges south of Assam; Sylhet, Cachar, Manipur, Irawadi valley near Bhamo, Chittagong, and Arakan in hill-forest. It is uncertain how far the species is found to the eastward. According to Anderson it inhabits Martaban. Pemberton's assertion that this species occurs at the base of the Himalayas in the lower ranges of Bhutan is probably a mistake. The type described by Dr. Harlan came from the Garo hills.

Habits. Good accounts of this animal are given by Burrough, in Harlan's original description, by Blyth and by Anderson. Like most other Gibbons, the Hoolock is usually found associating in flocks, often comprising fifty to a hundred individuals, or even more. An old male, however, is occasionally found solitary.

Gibbons are thoroughly arboreal, and Hoolocks are almost, if not entirely, confined to hill-forest. They move chiefly by means of their long arms, by which they swing themselves for prodigious distances from branch to branch and from tree to tree. They descend hill-sides at a surprising pace, their descent being accomplished by grasping bamboos or branches that bend beneath their weight, and allow them to drop until they can seize the ends of other bamboos or branches lower on the slope, and take another mighty swing downwards. They also ascend with great rapidity, swinging themselves from tree to tree.

When walking on the ground, the Hoolock rests on its hind feet alone, with the sole flat on the ground and the great toe widely separated from the other digits. The arms are usually held upwards, sometimes horizontally, their great length giving the animal a very peculiar aspect. Gibbons walk rather quickly, with a waddling gait, and can easily be overtaken by men when on the ground.

The food of these Apes consists of fruit, leaves, young shoots, spiders (of which they are very fond), insects, birds' eggs, and

almost certainly of young birds, if not of any birds they can capture. Anderson found that small birds were killed and devoured by Hoolocks in confinement with a method and eagerness that showed the prey to be the natural food of the Apes*. The Hoolock drinks with its lips, putting its head down to the water as monkeys do.

All species of *Hylobates* have a powerful voice, and the common name of the present form is taken from its peculiar double call, which is repeated several times. At a distance, the sound much resembles a human voice; it is a peculiar wailing note, audible from afar, and in the countries inhabited by these animals is one of the most familiar forest sounds. The calls commence at daybreak, and are continued till 9 or 10 A.M., several of the flock joining in the cry, like hounds giving tongue. After 9 or 10 o'clock in the morning the animals feed or rest, and remain silent throughout the middle of the day, but recommence calling towards evening, though to a less extent than in the earlier part of the day.

When captured young the Hoolock is easily tamed, and is, as a general rule, very gentle, docile, and good-tempered, exceedingly intelligent, and very cleanly in its habits. Some instances of savageness on the part of male animals have, however, been noticed. All the Gibbons are very delicate, and rarely live long in captivity.

But a single young is born at a time. Neither the period of gestation nor the age at which these animals become adult appears to have been ascertained.

2. Hylobates lar. *The white-handed Gibbon.*

Homo lar, *L. Mantissa*, App. p. 521 (1771).
Hylobates lar, *Illiger, Prod.* p. 68 (1811); *Blyth, Cat.* p. 5; *id. Mam. Birds Burma*, p. 1; *Tickell, J. A. S. B.* xxxiii, p. 196; *Sclater, P. Z. S.* 1870, pl. v, f. 1; *Anderson, An. Zool. Res.* p. 5; *id. Cat.* p. 28.

Myouk-lwai-gyau, Burmese; *Ungka étam*, Malay.

The skull is shorter in proportion to its length than that of *H. hoolock*. The orbital ridges in *H. lar* are more prominent, the muzzle shorter, the nasal orifice less elongated, the teeth smaller, and the palate shorter.

Colour. Black to fulvous or yellowish white, the back sometimes lighter than the lower parts, occasionally much variegated. Hands and feet always pale-coloured, usually white or yellowish white above. There is generally around the nude face a white ring of hair, comprising frontal band, whiskers, and beard; but the development of the ring varies, and in some specimens it is almost

* The dexterity of an allied species, *H. agilis*, in capturing birds on the wing had previously been observed (Martin, 'Man and Monkeys,' p. 430).

obsolete. Naked skin of the face black. According to all accounts, this species is much more variable in colour than *H. hoolock*, and pale-coloured specimens are far commoner, in some localities predominating.

Fig. 2.—*Hylobates lar*. (From a drawing by Col. Tickell.)

Dimensions. An adult male, according to Tickell, measures from crown to rump 19·6 inches, fore limb 25 (humerus 9·5, radius 9·5, hand 6), hind limb 19·5 (femur 7·5, tibia 7·5, foot 4·5). The height, when standing erect, is about 30 inches; some are said to be larger. Females are smaller than males. An adult skull is 4·15 inches long from the occiput, 3·05 from the foramen magnum, 2·95 broad.

Distribution. The white-handed Gibbon is found in Tenasserim in the forests skirting the hills up to an elevation of 3000 or 3500 feet above the sea, and throughout the Malayan peninsula. Tickell

says that it ranges as far north as the northern limit of Pegu, but not west of the dividing range between Pegu and Arakan; whilst Anderson states that it is found both in Arakan and Lower Pegu. I doubt the occurrence of this species in the latter countries, and I can find no satisfactory evidence of its existence in the Irawady or Sittoung valleys, although it very probably inhabits the hills east of the Sittoung. Further information as to the range of *H. lar* and *H. hoolock* in Burma is desirable.

Habits. The white-handed Gibbon is said by Tickell, who observed both species in their native forests as well as in captivity, not to be nearly so light and active as the Hoolock, and to walk less readily. The voice, too, is quite distinct, according to the same observer, in the two species. The cry of *H. lar* has been rendered in musical notation by Tickell, who has given, in the paper quoted above, an admirable account of the animal's habits. It is usually found in parties of from 6 to 20, composed of individuals of all ages.

The present species is said to drink by scooping up water in its hand, and not as the Hoolock does. So entirely does it depend on its hands for locomotion amongst trees, that it carries anything in its feet. Tickell, from whom I take these details, says that he has seen a party of *H. lar* escape thus with their plunder from a Karen garden in the forest.

In all other respects the habits of this species, so far as they are known, resemble those of *H. hoolock*. The young, almost always one in number,—twins being as rare as amongst human beings,—are born in the early part of the cold season, and each sticks to the body of its mother for about seven months, after which it begins gradually to shift for itself.

According to Helfer (J. A. S. B. vii, p. 858), the Siamang (*Hylobates syndactylus*) is found in Southern Tenasserim; but several of Helfer's identifications were incorrect, and as no one has since heard of the animal in the Tenasserim provinces, I agree with Blyth in believing that Helfer must have been mistaken. The Siamang is larger than the other species of Gibbon, standing about 3 feet 2 inches in height, and is perfectly black in colour throughout. It is doubtful if the Siamang occurs elsewhere than in Sumatra, though Wallace states that it is found in the Malay Peninsula, where the only species, except *H. lar*, noted by Cantor (J. A. S. B. xv, p. 173) is *H. agilis*. In Siam *H. leucogenys* (figured P. Z. S. 1877, pl. lxx) is said to occur.

At the same time there appears to be a large, not yet identified, Ape in the mountains of Tenasserim, but whether it belongs to the anthropoid Apes, or is a large tailless or nearly tailless *Macacus*, it is impossible to say. The only observers who have seen this animal, so far as I am aware, are Mr. W. Davison and Captain C. F. Bingham. The former writes to me that when collecting birds for Mr. Hume, on Muleyit, a mountain about 7000 feet high, east of Moulmain, he came suddenly on a number of Monkeys feeding on the ground in a very dense part of the forest. He had a good

look at one standing erect about 10 feet away, and considered it too large for a *Hylobates*, as its height was about 4 feet. It was, in front, of a deep ferruginous colour, and as it moved away it was distinctly seen to be tailless. Mr. Davison does not remember the colour of the back, but thinks it was the same as that of the underparts. He had only a half-charge of the smallest shot in his gun, so did not fire, and he never saw any of these animals again.

Captain Bingham informs me that a specimen was brought to him in the flesh (but unfortunately so decomposed that only the skeleton could be preserved) of a tailless female Ape, with long grizzled red hair on the outside of the limbs, and standing about 3 feet 6 inches high. This was near the place, Muleyit, where the animals above mentioned were seen by Mr. Davison. The skeleton was subsequently lost or mislaid. The same observer once saw a party of four or five large tailless monkeys at the foot of Muleyit, but these appeared to be black in colour. None of the animals resembled Gibbons.

Both Mr. Davison and Captain Bingham are excellent observers. The only known animal corresponding with their descriptions is the Ourang-outang, but so well-known a form would have been recognized by others. It is perhaps more probable that the animal seen may have been a tailless, or nearly tailless, *Macacus*.

Family CERCOPITHECIDÆ.

This family comprises all the Old-World Apes, Monkeys, and Baboons, with the exception of the anthropoid Apes. It is divided into two subfamilies, both represented in India.

Cheek-pouches present, stomach simple, tail variable .... *Cercopithecinæ.*

No cheek-pouches, stomach sacculated, tail always long .... *Semnopithecinæ.*

Subfamily CERCOPITHECINÆ.

In this subfamily are included not only all the common Indian Monkeys except those belonging to the Hanumán or Langur group, but also the closely allied African forms belonging to the genera *Cercopithecus* and *Cercocebus*. The African Baboons (*Cynocephalus*), distinguished by having the nostrils quite at the end of the muzzle, are also included by many writers.

By Blyth, Jerdon, and others, the short-tailed Indian Monkeys were classed in the genus *Inuus*, the long-tailed Macaques in *Macacus*. But the type of Lacépède's original genus *Macaca**

* Mém. de l'Inst. iii. p. 490 (1801).

(subsequently modified by F. Cuvier and Desmarest into *Macacus*) and of *Inuus* of Cuvier was the same animal, the Magot or Barbary Ape (*Simia inuus*, L.).

The length of the tail is certainly, by itself, not a sufficient generic distinction amongst these monkeys, for there is a complete gradation from the tailless *M. inuus*, through the stump-tailed *M. arctoides*, to the pig-tailed *M. nemestrinus*, and thence to *M. rhesus*, which leads to the long-tailed Macaques. The most peculiar of the Indian forms is *M. silenus*, which has by some naturalists been made the type of a distinct genus, *Silenus*. Even in this case, however, the only difference of any importance, the presence of a ruff of long hair round the face, is scarcely of generic rank. In the present work, all the Indian, Burmese, and Ceylonese species are comprised under *Macacus*.

A species of *Macacus* and two of *Cynocephalus* (the latter, as already noticed, now peculiar to Africa) have been discovered fossil in the Pliocene Siwalik beds of the Punjab. A tooth of *Cynocephalus* has also been found in the Pleistocene deposits of the Kurnool caves.

Genus **MACACUS**, Lacépède (1801).

Syn. *Inuus*, Cuv.; *Silenus*, Gray.

Body and limbs stout, tail variable. Males larger than females and with larger canines. Ischial callosities well developed. Cheek-pouches large. Muzzle considerably produced; nostrils opening obliquely some distance short of the end of the muzzle. Last molar of lower jaw with five tubercles. Dentition, as throughout the family, i. $\frac{4}{4}$, c. $\frac{1-1}{1-1}$, pm. $\frac{2-2}{2-2}$, m. $\frac{3-3}{3-3}$. Vertebral formula C. 7, D. 12 (occasionally 13), L. 7 (or 6), S. 3, C. 10–22.

The Macaques are much more compactly built than the *Semnopitheci*, and have shorter limbs and a considerably longer muzzle. The species of the present genus resemble each other in their habits; they are found in flocks, often of considerable size, and generally composed of both sexes and of all ages. They are active animals, though less rapid in their movements, whether on trees or on the ground, than the *Semnopitheci*. Their food is varied, most of the species, if not all, eating insects as well as seeds, fruits, &c., and one kind feeding partly on crustacea. They have occasionally been known to devour lizards, and, it is said, frogs also. All have the habit of cramming food into their cheek-pouches for mastication at leisure, a practice that must be familiar to any one who has fed monkeys in confinement.

The voice and gestures of all * the species are similar and differ entirely from those of both the Gibbons and *Semnopitheci*. Tickell notices this in his MS. notes, and gives the following details, which are worthy of extraction:—" Anger is generally silent, or, at most,

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* *M. silenus* may be an exception, as it is said to have a peculiar call. I have had no opportunities of observing this species in the wild state.

expressed by a low hoarse monotone '*heu*,' not so gular or guttural as a growl. Ennui and a desire for company by a whining '*hom*.' Invitation, deprecation, entreaty, by a smacking of the lips and a

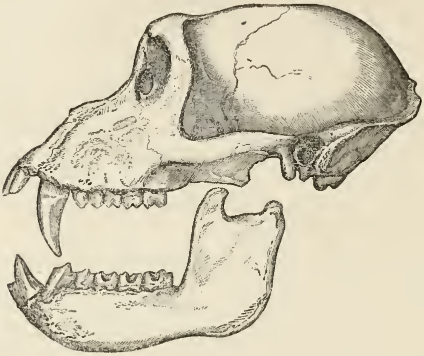

Fig. 3.—Skull of *Macacus rhesus*: ½ diam. (Copied from Anderson, 'An. Zool. Res.')

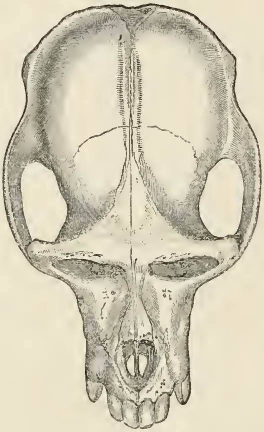

Fig. 4.—Skull of *Macacus rhesus*: ½ diam. (From Anderson.)

display of the incisors into a regular broad grin, accompanied with a subdued grunting chuckle, highly expressive, but not to be rendered on paper. Fear and alarm by a loud harsh shriek, '*kra*' or '*kraouk*,' which serves also as a warning to the others who may be heedless of danger. Unlike the *Presbytes* (*Semnopitheci*) and Gibbons, they have no voice if calling to one another."

The majority of the species are very docile when young. They thrive well, and several of them have bred in confinement. The

period of gestation is about seven months, only a single young one, as a rule, being produced at a birth. They become adult at the age of 4 or 5 years, but breed earlier.

Synopsis of Indian, Ceylonese, and Burmese Species.

A. Tail less than $\frac{3}{4}$ of head and body together.
  a. Colour black, a grey beard and ruff round face .... *M. silenus*, p. 16.
  b. Colour brown, no beard or ruff.
    a′. Tail about half as long as the head and body.
      a″. Hair straight, buttocks naked around callosities .... *M. rhesus*, p. 13.
      b″. Hair wavy or woolly, buttocks clad up to edge of callosities .... *M. assamensis*, p. 15.
    b′. Tail about $\frac{1}{3}$ as long as the head and body, and very slender.
      a″. A distinct horseshoe-shaped crest on the crown .... *M. leoninus*, p. 18.
      b″. No distinct crest .... *M. nemestrinus*, p. 20.
    c′. Tail very short, only one or two inches in length .... *M. arctoides*, p. 17.
B. Tail more than $\frac{3}{4}$ of head and body together.
  a. Hair of crown lengthened and distinctly radiating from middle.
    a′. General colour greyish brown, not rufous .... *M. sinicus*, p. 23.
    b′. General colour rufous or yellowish .... *M. pileatus*, p. 24.
  b. Hair of crown neither lengthened nor distinctly radiating .... *M. cynomolgus*, p. 21.

3. Macacus rhesus. *The Bengal Monkey.*

Simia rhesus, *Audebert, Hist. Nat. Singes*, 2ᵉ fam. p. 5, pl. i (1797).
Simia erythræa, *Schreber, teste Shaw, Gen. Zool.* i, p. 33 (1800).
Macacus (Pithex) oinops, *Hodgs. J. A. S. B.* 1840, ix, p. 1212.
Inuus rhesus, *Blyth, Cat.* p. 8; *Jerdon, Mam.* p. 11.
Macacus rhesus, *Anderson, An. Zool. Res.* p. 55; *id. Cat.* p. 67.

Bandar, H.; *Markat*, Beng.; *Wándar*, *Puriz*, *Púnj*, or *Ponj*, Kashmir; *Gye*, Ho Kol.

Fur of moderate length (rather long in Himalayan specimens) and straight, not wavy or woolly. Hair of crown not radiating from centre. Tail two fifths to one half the length of the head and body, tapering, not tufted at the end. Caudal vertebræ usually 17 or 18. Ears naked. Buttocks naked for some distance around the callosities.

Colour. General colour hair-brown with a greyish tinge, the hinder quarters being generally rufous or yellowish, especially in adults. The hair is ashy towards the base, and more or less annulated and tipped with light brown throughout the upper parts, giving a minutely speckled appearance. Lower parts scarcely paler.

Face and callosities flesh-coloured, being bright red in adults at all times.

Dimensions. Head and body 22 inches, tail 10 without the hairs, 11 with, hand 4½, foot 6. These are the measurements (by Hodgson) of a very large individual, doubtless a male. Females measure much less, body 16 to 18 inches, tail about 6 to 7. Skull of a male 5 inches long from occiput, 3·5 from foramen, breadth across zygomatic arches 3·55 ; of a female 4·3 and 3 inches long, 3·1 broad.

Distribution. The Rhesus is the common monkey of Northern India from the Himalayas to the Godavari river. It is found in Kashmir up to an elevation of 5000 feet (10,000 according to some authorities), and there is a colony, I believe of this species, on the top of Jako hill, about 8500 feet high, at Simla. Specimens have also been sent from Nepal by Hodgson (as *M. oinops*) and by Mandelli from Sikhim, but from low elevations. *M. rhesus* is found close to the west coast near Bombay, but not much further south ; it is common throughout Guzerat and the Central Provinces, in Bengal, Orissa, and parts of the Northern Circars. There is a specimen in the Calcutta Museum from Samaguting, in Assam, and Anderson met with a form not distinguishable from this in Upper Burma and Yunnan. All the specimens obtained, however, were in captivity, but he saw a colony of wild monkeys that appeared to belong to this species on the Irawadi below Yenankhyoung. Closely allied forms (*M. lasiotis* and *M. cyclopis*) occur in China.

Habits. Although this monkey is not regarded as sacred by Hindus, it is never molested by them, and in many parts of the country it is as impudent as the Hanumán and even more mischievous. Very intelligent, and, when young, fairly docile, it is one of the commonest animals kept tame, and throughout Northern India it is the monkey carried about by itinerant showmen, and taught to perform tricks of various kinds. It is a most amusing creature, the incarnation of mischief and curiosity, but frequently rather ill-tempered. Older individuals are usually savage.

In the wild state it is found in herds, often of considerable size. It has generally but little fear of man, and may occasionally be found in native villages, though less commonly than the Hanumán. It is very frequently seen on the ground searching for food, and it eats spiders and many kinds of insects, especially Lepidoptera and Orthoptera, besides fruits and seeds. Flocks of this monkey are more frequently seen near cultivation, especially around tanks or amongst trees on the banks of streams, than in forest jungle. These animals are very quarrelsome, perpetually screaming and fighting, or teasing each other—in fact, they behave very much like unruly children.

M. rhesus swims well and takes readily to water.

4. **Macacus assamensis.** *The Himalayan Monkey.*

Macacus assamensis, *McClelland, Horsfield, P. Z. S.* 1839, p. 148; *Anderson, An. Zool. Res.* p. 64; *id. Cat.* p. 70.
Macacus (Pithex) pelops, *Hodgson, J. A. S. B.* ix, p. 1213 (1840).
Inuus pelops, *Jerdon, Mam.* p. 11.
? Macacus problematicus, *Gray, Cat. Monkeys &c. B. M.* 1870, p. 128.
? Macacus rheso-similis, *Sclater, P. Z. S.* 1872, p. 495, pl. xxv; *ib.* 1875, p. 418.

Fur of moderate length, wavy, and, in Himalayan specimens, distinctly woolly in texture. Hair of crown often indistinctly radiating, not lengthened. Tail nearly half as long as the head and body, not tufted. Buttocks well covered with hair, except on the callosities.

The skull differs but little from that of *M. rhesus*, except in being larger, but appears higher, with a deeper lower jaw.

Colour. Above uniform dark brown, without any grey tinge; hinder parts the same, not rufescent, as in *M. rhesus*; lower parts distinctly paler. Fur destitute or nearly destitute of annulation, and, in general, of pale tips, slightly lighter in colour, but not ashy, at the base. Face dusky (perhaps variable).

Dimensions. Adults apparently are considerably larger than *M. rhesus.* Head and body (probably of an average specimen) 20 inches, tail 9½; of another, a female, 17·2 and 7·6. A male, nearly adult, skull from Upper Burma measures 5·54 inches in extreme length from occiput to premaxillaries, and 3·63 broad, according to Anderson. An adult female skull from Nepal measures 4·7 inches in extreme, and 3·2 in basal length, 3·3 broad.

Distribution. The Himalayan range as far west as Masuri, or perhaps further, from near the base of the hills to a considerable elevation; also Assam, the Mishmi hills, and Upper Burma near Bhamo, whence obtained by Anderson. The same species appears also to be found in the Sandarbans east of Calcutta *, and there is in the British Museum a specimen very probably of the same animal from the Laos country in Upper Siam. In Sikhim this species is generally seen between 3000 and 6000 feet above the sea. McClelland's original type was from Assam, possibly from the hills to the northward. The type of *M. problematicus* of Gray was from Dhalimkot in Bhutan.

Habits. This species much resembles *M. rhesus*, but is, whether wild or tame, more sluggish in all its movements. Its voice, too, is different, though the difference is small.

I was at first disposed to consider the Himalayan form, *M. pelops*, distinct from *M. assamensis*, but after going over all the evidence

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* Anderson, P. Z. S. 1872, p. 529, and An. Zool. Res. p. 64. In his last work, the 'Catalogue of Mammalia in the Indian Museum,' Calcutta, p. 68, Anderson has referred the Sandarban specimens to *M. rhesus*, on account of certain cranial characters, and especially the size of the skull. The description, however, agrees with that of *M. assamensis* in what I believe to be the characteristic peculiarities of that species.

I am inclined to agree with Anderson, who unites them, and who fortunately was able to examine and describe the type of the last-named form, now no longer to be found. That the Sikhim monkey is perfectly distinct from *M. rhesus* I am certain, and I have seen several young specimens of the former tame. They appear stouter, and differ in fur, coloration, visage, and habits, and I think the limbs are proportionally shorter.

5. **Macacus silenus.** *The lion-tailed Monkey.*

Simia silenus, *Schreb. Säugethiere*, i, p. 87, pl. xi, *partim* (*nec Linn.*).
Simia ferox, *Shaw, Mus. Leverianum*, p. 69, pl. (1792).
Inuus silenus, *Blyth, Cat.* p. 7; *Jerdon, Mam.* p. 10.
Silenus veter, *Gray, Cat. Monkeys &c. B. M.* 1870, p. 32 (*nec* Simia veter, *Linn.*).
Macacus silenus, *Anderson, An. Zool. Res.* p. 93; *id. Cat.* p. 66.

Shia bandar, H.; *Nil bandar*, Beng.; *Chingala*, *Nella manthi*, Mal.; *Singalika*, Can.; *Karingode*, Kurg.; *Kondamachu*, Tel.; *Kurankarangu*, Tamul.

Fig. 5.—*Macacus silenus.*

Fur long. A ruff of longer light-coloured hair on chin, throat, cheeks, and temples, encircling the head, except on the forehead, and concealing the ears, which are naked. Hair radiating from centre of crown. Tail slender, about one half to three quarters the length of the head and body, and tufted at the tip; caudal vertebræ 17.

Colour. Black throughout, except the beard and ruff, which are grey. In some young specimens the abdomen is brown. Face and hands black, the callosities of a fleshy tinge.

Dimensions. Head and body of a male 21 inches, tail $13\frac{1}{2}$; of another 20 and 15: of a female, head and body 18, tail $12\frac{1}{2}$; of

another specimen 18 and 10. These are from Travancore specimens measured by Mr. F. W. Bourdillon, and show much variation in the length of the tail. A female skull measures:—Length to occiput 4·4 inches, basal length 3·1, breadth 2·9.

Distribution. The forests of the Syhadri range or Western Ghats near the Malabar coast from about 14° north to Cape Comorin, and at a considerable elevation above the sea. Most common in Cochin and Travancore.

Habits. The lion-tailed Monkey, according to Jerdon, to whom we are indebted for the only authentic account of this animal i a wild state, inhabits the most dense and unfrequented forests of the hills near the Malabar coast in herds of from twelve to twenty or more. It is shy and wary. In captivity it is sulky and savage, and not easily taught. The call of the male is said (J. A. S. B. xxviii, p. 283) to resemble the voice of a man.

As I have shown elsewhere (P. Z. S. 1887, p. 620), this monkey is not *Simia silenus* of Linnæus, nor is it *S. veter* of the same author. As, however, the specific name *silenus* has been used generally for this species for more than a century, naturalists are unwilling to change it. The name Wanderoo, usually applied to *M. silenus* by European naturalists, is also a mistake, being the Ceylon name of the *Semnopitheci*, erroneously given to the present species by Buffon. The "lion-tailed Monkey" is a name of Pennant's.

6. **Macacus arctoides.** *The brown stump-tailed Monkey.*

Macacus arctoides, *Is. Geoffr. Mag. Zool.* 1833, Cl. i, pl. 11; *Murie, P. Z. S.* 1872, p. 770; *Anderson, An. Zool. Res.* p. 45, pls. i, ii; *id. Cat.* p. 74.
Papio melanotus, *Ogilby, P. Z. S.* 1839, p. 31.
Macacus brunneus, *Anderson, P. Z. S.* 1871, p. 628; *id.* 1872, p. 203, pl. xii (juv.).
Inuus speciosus, *Blyth, Mam. Birds Burma,* p. 6.

Hair on head and shoulders very long, as much as 4½ inches in adults. Tail very short, almost rudimentary, sparsely clad with hair or naked in old animals; buttocks naked for some distance around callosities. Caudal vertebræ 11 (probably fewer in some individuals).

Colour. Dark brown; in some specimens blackish brown above, paler below. In the young the hairs are the same tint throughout, in older individuals the terminal portion of each hair is very closely and minutely annulated with several alternating rings of golden yellow and dark brown. Face and buttocks bright red.

Dimensions. Probably about 2 feet in length, the tail only one to two inches. No trustworthy measurements of adults are recorded. An adult male skull measures 5·3 inches in extreme length, 3·7 in basal length, and 3·5 in zygomatic breadth.

Distribution. Not very well ascertained. Apparently this monkey is found in some of the hill-ranges south of Assam, and

there is a specimen in the Calcutta Museum said to have been brought from Tipperah. To the eastward this form is found in the Kakhyen hills of Upper Burma and also in Cochin China.

Habits. Nothing is definitely known of this monkey in the wild state. It is said to be a hill species.

Blyth refers the present form to *M. speciosus* of F. Cuvier, a name generally applied to a Japanese species, and Anderson is disposed to concur. *M. speciosus* is said by Temminck ('Fauna Japonica') to have been founded on a drawing by Diard or Duvaucel of a monkey living at Barrackpur near Calcutta. The figure resembles a pig-tailed Monkey (*M. nemestrinus*) with most of its tail cut off as much as it does either *M. arctoides* or the Japanese species. I agree with Anderson that the name *M. speciosus* should be dropped.

A stump-tailed monkey of rufous-brown coloration, said to be from the Malay Peninsula, has been named *M. rufescens* by Anderson (P. Z. S. 1872, pp. 204, 495, pl. xxiv); and two other forms, *M. maurus* and *M. ocreatus*, inhabit some of the Malay islands. A very large form, *M. tibetanus*, has been described from Moupin, in Eastern Tibet, by A. M.-Edwards. In his latest work Anderson has united this form to *M. arctoides*.

I am informed by Mr. W. Davison that he had for some time alive a monkey of a kind apparently allied to *M. arctoides*, which had been captured by a shikari near Bankasún in the extreme south of Tenasserim. Mr. Davison has also seen a second specimen, a female, his own being a male. Unfortunately the first specimen was subsequently lost. These animals were of a pale cream-colour throughout, slightly tinged with rusty on the shoulders and back; face and hands flesh-coloured. The tail was quite rudimentary, less than an inch long, and turned on one side in both specimens, so that at the first glance both appeared to be tailless. Both were very small, although shown to be adults by the teeth,—each being not above 15 inches high when it stood erect. They had a sharp piercing voice, and exhaled a peculiar fetid odour. The one kept by Mr. Davison was excessively insectivorous, and preferred insects to fruit or bread. These monkeys apparently belonged to an undescribed species.

It is quite possible, too, that the large tailless ape seen by Mr. Davison and Captain Bingham in the Tenasserim mountains, and described in the notes on *Hylobates lar* (*ante*, p. 9), may be an ally of *M. arctoides*, though apparently much larger than that species.

7. Macacus leoninus. *The Burmese pig-tailed Monkey.*

Inuus leoninus, *Blyth, Cat.* p. 7 (1863); *id. Mam. Birds Burma*, p. 4.
Macacus andamanensis, *Bartlett, P. Z. S.* 1869, p. 467.
Macacus leoninus, *Sclater, P. Z. S.* 1870, p. 663, pl. xxxv; *Anderson, An. Zool. Res.* p. 52; *id. Cat.* p. 71.

Myouk-mai, Burm.; *Myouk-la-haing*, Arakan.

A somewhat short-limbed, stout form. The hairs on the shoulders and fore part of back very long, 4 to 5 inches in males, but rather short on the lower back and rump. Head broad, rather flat; hair radiating in the centre of the crown and surrounded in front and

Fig. 6.—*Macacus leoninus.* (P. Z. S. 1870, pl. xxxv.)

on both sides by a horseshoe-shaped crest, the anterior or supra-orbital portion of which consists of very stiff hairs. Tail about one third the length of the head and body, slender, well clad with hair. Caudal vertebræ 17 to 18.

The skull is distinguished from that of *M. nemestrinus* by having the muzzle much shorter.

Colour. Males are dark brown above, the horseshoe-shaped crest, the lower back, and the upper surface of the tail black; sides of head and buttocks grey; lower parts, including lower surface of tail, light greyish brown. The tail is somewhat tufted, and has sometimes a bright ferruginous tuft at the end. Females are greyer and rather paler, and have no black on the head or back, though the tail is blackish above. The fur is finely annulated, except on the head, loins, tail, and buttocks, with yellow and blackish brown above, and with dusky and whitish below. On the long hair of the shoulders there are as many as ten to twelve rings, five or six of each colour, on each hair. Base of hair greyish brown. Face dusky flesh-colour.

Dimensions. Length of male: head and body 23 inches; tail without hair at end 8, with hair 10. Females considerably less. Skull of adult male 5·3 inches long from occiput, 4 from foramen, and 4 broad across the zygomatic arches; of a female 4·45 and 3·1 inches long and 2·95 broad.

Distribution. Originally described from specimens collected by Sir A. P. Phayre in Arakan. Anderson has since referred to this species specimens from Upper Burma, and a young animal from Perak, Malacca. The latter identification is very questionable, as the Malay peninsula is inhabited by the true pig-tailed Monkey, *M. nemestrinus.* A few individuals have been introduced into the Andaman Islands, but the species is not indigenous.

Habits. Scarcely anything is known, except that the young and females are docile in captivity, old males fierce. In this, as probably in most other respects, this species is very similar to the next.

8. **Macacus nemestrinus.** *The pig-tailed Monkey.*

Simia nemestrina, *Linn. Syst. Nat.* i, p. 35 (1766).
Inuus nemestrinus, *Blyth, Cat.* p. 7.
Macacus nemestrinus, *Anderson, An. Zool. Res.* p. 77; *id. Cat.* p. 72.

Myouk-padi, Burmese; *Ta-o-ti,* Burmese of Tavoy; *Bruh,* Malay.

Body stout; limbs long and powerful; muzzle in adults much produced. Fur slightly lengthened over shoulders, and short generally. Hair radiating in centre of crown, but not surrounded by the distinct horseshoe-crest of *M. leoninus* (there is, however, an approximation to it in some specimens). Tail very slender, rather more than one third the length of the head and body. Caudal vertebræ 18.

The muzzle, in old male skulls especially, is greatly produced, and much resembles that of the Baboons (*Cynocephalus*) in form. The orbits are nearly as high as broad.

Colour. Crown of the head dark brown or black, except at the sides; a broad black stripe extends throughout the middle of the back in many specimens, becoming broader on the rump; but in young animals and in some adults the back is brown throughout. Fur of upper surface generally yellowish brown, but varying from pale orange-brown to blackish brown in different specimens; lower parts greyer brown or albescent; hands and feet sometimes darker than the limbs. Tail black above, light yellowish brown below. The fur on the upper parts and the outside of the limbs is closely annulated with yellow and brown; basal portion of hair grey.

Dimensions. Tickell gives as the measurements of an old male from Yé:—Head and body $18\frac{1}{4}$ inches, tail $7\frac{3}{4}$, hand $3\frac{3}{4}$, foot 6, height at shoulder 16; the size, however, varies much, and many individuals attain a much greater development, rivalling, as Anderson remarks, a good-sized mastiff both in height and strength. Of two skulls of adult males in the British Museum one measures 6·5 inches long from the occiput and 5 from the foramen, by 4·2 broad across the zygomatic arches; whilst another male adult skull is only 5·78 and 4·4 long and 3·8 broad; and a third from Mergui 5, 3·6, and 3·5. Females must be very nearly as large as males; the skull of a very old specimen from Tenasserim is 6·2 and 4·2

inches long and 4·25 broad. It is just possible that two distinguishable forms, a larger and a smaller, are indicated by these measurements.

Distribution. The pig-tailed Monkey is found throughout a great part of Tenasserim, although apparently not common, except in the extreme south of the province—a circumstance that probably explains why the occurrence of *M. nemestrinus* in Southern Burma has been generally overlooked. There is, however, a skeleton in the British Museum (the old female of which the skull-measurements are given above) sent by Major Bingham from Meplay valley, Thoungyeen river, and a skull presented by Dr. Oldham from Mergui. Tickell, too, in his MS. notes, records and describes specimens from Yé; and Mr. W. Davison tells me that the species is common about Malewún and Bankasún. The pig-tailed Monkey is not found north of Tenasserim, but extends south into the Malay Peninsula, Sumatra, and Borneo.

Habits. The pig-tailed Monkey in Tenasserim, according to Tickell, frequents thick jungle about the base of the hills. The voice and manners are similar to those of *M. rhesus.* When the animal is excited the tail is held in the form of an S. In Sumatra *M. nemestrinus* is said by Sir S. Raffles to be peculiarly docile, and to be trained to climb the cocoa-nut trees and gather nuts for its master. This can only apply to females and young animals; old males are very savage, and they are formidable animals from their size and strength.

The period of gestation in this species has been ascertained to be 7 months and 20 days.

9. Macacus cynomolgus. *Macaque, or crab-eating Monkey.*

Simia cynomolgus, *Schreb. Säugth.* i, p. 91, pl. xiii (fig. *Buffon*), *nec Linn.*
Macacus irus, *F. Cuv. Mém. Mus.* iv, p. 120 (1818).
Macacus carbonarius, *F. Cuv. Hist. Nat. Mam.* pl. xxxii (1825); *Blyth, Cat.* p. 9.
Macacus aureus, *Is. Geoffr. Voy. Bél., Zool.* p. 58.
Macacus cynomolgus, *Blyth, Cat.* p. 9; *id. Mam. Birds Burma,* p. 7; *Anderson, An. Zool. Res.* p. 73; *id. Cat.* p. 61.

Myouk-ta-nga, Burmese; *Ta-o-tan,* Tavoy and Arakan; *Kamui-awut,* Talain; *Da-ouk, Sha-ok-li,* Karen; *Krá,* Malay.

Fur of moderate length and nearly straight. Hair of the crown not lengthened, and usually directed backwards, but occasionally radiating somewhat irregularly from one or more centres, or forming a rudimentary crest. Tail nearly as long as the head and body. Caudal vertebræ 22.

Skull long and low, with the muzzle produced, and the orbits much broader than high.

Colour. The general tint of the upper surface varies from dusky or greyish brown to rufous or golden brown in different individuals; lower parts light greyish brown to nearly white. The hair of the

upper parts varies from light brown to almost black at the base, the terminal portion being annulated with yellow and brown or black; on the shoulders there are usually three rings of each colour, fewer behind. In young specimens there is no annulation. Face, ears, and callosities varying from flesh-colour to dusky. Eyelids white or bluish white in many cases.

Varieties. There are two prominent varieties of this well-known monkey—a dark-coloured form with dusky face (*M. carbonarius*), and a golden-rufous race (*M. aureus*). Both of these, as well as the normal yellowish-brown type, are found in Burma. The colour of the face varies greatly, some dark-furred individuals having a pale face, and *vice versâ*.

Dimensions. An old male measures:—head and body 22 inches, tail 19, hand 3·9, foot 5·5. In another the head and body are about 21 inches, tail 20. Females are smaller. A large adult male skull measures 5·3 inches in extreme length, 4·1 from anterior margin of foramen magnum, and 3·6 in breadth across the zygomatic arches; a female skull 4·35, 3, and 2·9 in the three dimensions.

Distribution. The crab-eating Monkey is found throughout a great part of Burma, including Arakan, especially along tidal creeks near the coast, and in the deltas of rivers. It is not known to occur on hills, nor has it been recorded with certainty from Upper Burma. It is found in the Nicobar Islands (? introduced), but not in the Andamans. Beyond our area it has a wide range throughout Siam and the Malayan peninsula and islands.

Habits. Tickell, in his MS. notes, gives an excellent description of this animal, from which most of the following details are derived. He says that these monkeys are usually met with in small parties of five to fifteen, consisting of one old male, four or five females, and their young. They are especially common on the banks of tidal creeks, where they live amongst the mangroves, and feed upon seeds, Crustacea, and insects. The claws and body of a crab were found in the cheek-pouch of a female shot in Arakan by Captain (afterwards Sir A.) Phayre. The tidal creeks are, in Tenasserim and Arakan, and in the delta of the Irawadi, the only highroads of the country; the monkeys, consequently, become familiarized with the sight of men, and will allow of a near approach and even pick up rice or fruit thrown to them. This I can confirm from my own observation; I have even known them, in Pegu, follow a boat for some distance.

They swim and dive well. Tickell mentions an instance of a wounded male, that had been shot and placed in a boat, jumping overboard and diving repeatedly, once to a distance of 50 yards, in order to avoid recapture.

There is no particular season for breeding. The young clings tenaciously to the mother for the first month, after which it ventures out little by little, and, to quote Tickell, "it is exceedingly amusing to watch the rough tenderness with which the latter [the mother] checks at first the over-venturesome sallies of the little

animal, which is often pulled back by the tail, chastised with a cuff on the head, and then gravely huddled up to the breast, where the shrieks and chattering of the delinquent, which is just as fractious as a child under such circumstances, are soon appeased."

Like the rest of the genus, this monkey is easily tamed if taken young; it is intelligent and full of antics. The females continue gentle, but the males become morose and savage as they grow old.

This species is the Macaque of Buffon, but is not the *Simia cynomolgos* of Linnæus, which is an African baboon. F. Cuvier called attention to these facts in 1818, but his remarks appear to have been generally overlooked. As in the case of *M. silenus*, the name has been used too long to be altered now with a probability of a less familiar term being generally accepted.

10. **Macacus sinicus.** *The Bonnet Monkey.*

Simia sinica, *Linn. Mantissa*, p. 521 (1771).
Cercocebus radiatus, *Geoffr. Ann. du Mus.* xix, p. 98 (1812).
Macacus radiatus, *Blyth, Cat.* p. 8; *Jerdon, Mam.* p. 12.
Macacus sinicus, *Anderson, An. Zool. Res.* p. 90; *id. Cat.* p. 59.

Bandar, H.; *Makadu*, *Wánar*, *Kerda*, Mahr.; *Manga*, *Kodaga*, Can.; *Koti*, Tel.; *Koranga*, *Vella manthi*, Mal.; *Kurangu*, Tamul; *Mucha*, Kúrg; *Kodan*, Toda.

Fur of moderate length, generally straight and smooth. Hair of the crown lengthened and radiating from the vertex, but not usually extending over the forehead, where the shorter hair is parted, as a rule, down the middle. Tail nearly or quite as long as the head and body. Caudal vertebræ 22.

The skull is long, flattened over the brows, with the orbits much broader than high and nearly vertical. Compared with the skull of *M. rhesus*, that of *M. sinicus* is vertically much lower; thus the skull of which the measurements are given below is 3·05 inches in height, the mandible included, whilst a skull of *M. rhesus* one tenth of an inch shorter is, with its mandible, 3·5 inches high.

Colour. Hair-brown to greyish brown above, pale brown or whitish below. Fur annulated towards the ends in some specimens. Face and ears flesh-coloured.

Dimensions. Head and body of an adult male 19½ inches, tail 22; weight 16 lbs. The tail, however, is generally rather longer in proportion. An adult male skull is 4·8 inches long from occiput, 3·5 from foramen, and 3·5 broad across the zygomatic arches.

Distribution. Southern India, extending on the West Coast to the neighbourhood of Bombay, but on the East not further than the Godavari; it is doubtful indeed if this species is found so far north as that river.

This monkey is replaced in Ceylon by the next, which appears only to differ in colour. In general *M. sinicus* has shorter and smoother fur, and the radiating hair on the crown is shorter, not

extending to the forehead, but a specimen from Travancore in the British Museum has rough hair like *M. pileatus* devoid of annulation, and an unusually long topknot.

Habits. Very similar to those of other members of the genus. This is the common monkey, tame or wild, of Southern India, found both in wild jungles and in populous towns, where it pillages the shops of the dealers in fruit and grain. Jerdon says "it is the most inquisitive and mischievous of its tribe, and its powers of mimicry are surpassed by none." I do not think that it can excel *M. rhesus* in inquisitiveness and mischief, but I believe that it is, on the whole, more docile.

11. **Macacus pileatus.** *Toque Monkey.*

Simia pileata, *Shaw, Gen. Zool.* i, pt. 1, p. 53 (1800).
Macacus sinicus, *Kelaart, Prod.* p. 8, *nec Linn.*
Macacus pileatus, *Blyth, Cat.* p. 9; *Anderson, An. Zool. Res.* p. 91; *id. Cat.* p. 61.

Raláwa, Cingalese.

Hair rather long, wavy and rough, that of the crown forming a topknot radiating from the vertex, and considerably lengthened, extending in front nearly to the eyebrows. Tail nearly as long as head and body. Caudal vertebræ 24. The skull is similar to that of *M. sinicus.*

Colour. Rufous or yellowish brown above, white or whitish below. The upper surface of the tail, hands, and feet sometimes more dusky. Fur hair-brown at base, tipped and sometimes annulated with rufous or yellow. Face and callosities flesh-coloured. Ears, palms, and soles dusky.

Dimensions. Head and body of an adult male 21 inches, tail 18 (*Kelaart*). Schlegel gives 20 and 23 inches, probably from skins. A male adult skull is 4·9 inches in extreme length, 3·5 in zygomatic breadth.

According to Kelaart the present form is of less robust make and smaller size than the Southern Indian form, but it is very doubtful if there is any constant difference. For my own part, I doubt if the two are entitled to specific distinction.

Distribution. Ceylon, throughout the island.

Habits. Precisely the same as those of *M. sinicus.* Kelaart says that the latter is more intelligent and less mischievous; but, as already remarked, the two are probably mere varieties of the same species. *M. pileatus* is the monkey commonly kept tame in Ceylon, and carried about by jugglers and itinerant mountebanks for the amusement of children, exactly as *M. rhesus* is in Northern and *M. sinicus* in Southern India. It may be mentioned here that those who have only seen monkeys in Europe, and especially in cages, have in general a very imperfect idea of the intelligence, love of fun, and power of mimicry that these animals possess.

Subfamily SEMNOPITHECINÆ.

The members of this subfamily are easily distinguished by their slender form, and by the absence of cheek-pouches. They are more purely herbivorous than the Macaque monkeys, and a considerable portion of their food consists of leaves and young shoots. Their digestive organs are much modified, and the stomach bears some resemblance to that of ruminant ungulates, being large in size and divided into three portions. In consequence probably of the more restricted nature of their food, these monkeys are far more delicate than the species of *Macacus*, and are less easily kept alive in confinement. They are consequently not nearly so well represented in European museums, and they have been less studied by European naturalists. Very little is known of their breeding-habits or of their life-history in general.

The only Indian genus is *Semnopithecus*, which is found almost throughout the Oriental region. The corresponding African genus *Colobus* is distinguished by having the thumb of the hand rudimentary.

For descriptions of the anatomy, see Otto, Acad. Cæs. Leop. Nova Acta, xii, 1825, p. 505 (a partial translation of this appeared in the 'Zoological Journal,' vol. iii, p. 249); Owen, Trans. Zool. Soc. i, p. 65; and Murie, P. Z. S. 1865, p. 740.

Genus **SEMNOPITHECUS** *, F. Cuvier, 1821.

Syn. *Presbytis*, Eschscholtz.

Body and limbs slender. Tail long, exceeding in length the head and body together in all Indian, Ceylonese, and Burmese species. Thumb short, but well developed. A row of long stiff black hairs across the eyebrows. Vertebræ: C. 7, D. 12, L. 7, S. 3, C. 25–30.

Dentition: i. $\frac{4}{4}$, c. $\frac{1-1}{1-1}$, pm. $\frac{2-2}{2-2}$, m. $\frac{3-3}{3-3}$.

The skull is rounder than in the Macaques, the breadth of the brain-case being relatively greater and the development of the muzzle less. The facial angle is consequently higher, although the intelligence is certainly not superior, and is apparently lower.

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* Both the genera *Semnopithecus* and *Presbytis* were proposed in the same year, 1821, the former, in the French form *Semnopithèque*, for *S. entellus* and *S. melalophos* (Hist. Nat. des Mammifères), the latter for *S. mitratus* (Kotzebue's 'Entdeckungs Reise,' iii, p. 196). The latter species is somewhat aberrant. The name *Semnopithecus* has been more widely used than *Presbytis*, and is accordingly adopted here.

Fig. 7.—Skull of *Semnopithecus entellus.*

Synopsis of Indian, Ceylonese, and Burmese Species.

A. Hair of crown radiating from a point on the forehead.
  a. Head scarcely paler or not paler than back.
    a'. Hands and feet black. No crest...... *S. entellus*, p. 27.
    b'. Hands and feet same colour as limbs. A crest .... *S. priamus*, p. 31.
  b. Head distinctly paler than back.
    a'. Hands and feet black, lower parts yellowish .... *S. hypoleucus*, p. 33.
    b'. Hands and feet scarcely darker than limbs, lower parts greyish .... *S. schistaceus*, p. 30.
B. Hair of crown radiating from two frontal points, one on each side.
  a. Nearly black above, inside of thighs white *S. femoralis*, p. 42.
C. Hair of crown directed backwards throughout, not radiating.
  a. No crest; hair of crown not longer than on temples and nape.
    a'. Body black or dusky brown above and below.
      a''. Head black throughout, like body .. *S. barbei*, p. 39.
      b''. Head pale brown, cheeks same colour as crown .... *S. johni*, p. 33.
      c''. Cheeks paler than crown, sacral region grey .... *S. cephalopterus*, p. 34.
      d''. Cheeks paler than crown, sacral region black .... *S. ursinus*, p. 36.
    b'. Body yellowish white throughout .... *S. senex*, p. 35.

b. No crest. Hairs of crown longer than those of temples and occiput, and forming a cap. Body dark grey above, yellow below .. *S. pileatus*, p. 37.
c. A crest of longer hairs.
  a'. A pointed crest on occiput. Adults ashy to blackish brown, young yellowish brown .... *S. obscurus*, p. 41.
  b'. Crest compressed and longitudinal on crown of head; body dark grey above, whitish below .... *S. phayrei*, p. 39.
d. A crest? Black above, ferruginous below, neck white; young rufescent white throughout .... *S. chrysogaster*, p. 38.

The remains of a single species of *Semnopithecus* have been found in the Siwalik beds, and those of another in the Pleistocene Cave-deposits of Kurnool.

12. Semnopithecus entellus. *The Langúr or Hanumán Monkey.*

Simia entellus, *Dufresne, Bull. Soc. Phil.* 1797, p. 49.
Semnopithecus entellus, *Blyth, J. A. S. B.* xii, p. 169, xiii, p. 470; *Hutton, P. Z. S.* 1867, p. 944; *Anderson, An. Zool. Res.* p. 15; *id. Cat.* p. 35.
? S. anchises, *Elliot, Blyth, J. A. S. B.* xiii, p. 470, xvi, p. 733.
Presbytis entellus, *Blyth, J. A. S. B.* xvi, pp. 372, 1271, pl. liv, fig. 1; *id. Cat.* p. 11; *Jerdon, Mam.* p. 4.

Langúr and *Hanúmán*, Hindi; *Wánar*, Maráthi; *Musya* *, Canarese; *Kode*, Kúrg; *Sárá*, Korku (Sátpura Hills) and Ho (Kol).

No crest. Hair on the crown of the head radiating in all directions from a point about one-third the distance back from the eyebrows to the occiput. Ears large, not covered by the hair of the cheeks. Hair of the body of the same colour throughout, and generally somewhat wavy.

Colour. Head, body, limbs, and tail pale earthy or greyish brown, or pale isabelline throughout; hands and feet always black above. The back and the outside of the limbs are sometimes darker, and the lower parts paler; the head too is said to be occasionally lighter in colour, but the difference is not great. Face, ears, and soles of hands and feet black.

Dimensions. Average size of an adult male:—head and body about 2 feet long; tail, without hair at end, 38 inches. Females are rather less. Large males measure considerably more; head and body 30 inches, or even more according to Jerdon. Weight of a male 22 lbs., of a female 18 lbs. An adult male skull measures: extreme length from alveolar border of premaxillaries to back of head 5·05 inches, to foramen (basal length) 3·6, width across the zygomatic arches 4.

* This and the next name may belong to *S. priamus*.

Distribution. The northern portion of the Indian Peninsula, including South-western Bengal, Orissa, the Central Provinces, Bombay, Guzerat, Southern Rájputána and part of the N.W. Provinces, extending to Kattywar and probably to Cutch (J. A. S. B. xli, pt. 2, p. 220), but not to Sind or the Punjab. Hutton states that this species is not indigenous east of the Hugli or north of the Ganges, and of a line drawn westward from Allahabad to near Búndi on the Chambal, and that colonies found near certain Hindu shrines, as Muttra in the North-west Provinces and Kishnagurh in Bengal, have been introduced. The latter is probable, but it is certain that Langurs occur in the Oudh Terai, and generally along the base of the Himalaya (Jerdon mentions their occurrence near Pankabari, in Sikhim), and they are more likely to be this species than *S. schistaceus*. It is remarkable that the range of so well-known an animal should be so imperfectly ascertained. The southern limit of *S. entellus* also needs verification. This is certainly the species inhabiting the Bombay Deccan; but Blyth mentions (J. A. S. B. xiii, p. 471) an immature black-handed specimen from Coimbatore, well within the range of the pale-handed *P. priamus*, and Lydekker has referred to *S. entellus* the remains from the Kurnool caves. The range of this Langur on the Eastern coast extends, I believe, south of the Godavery.

Habits. Few, if any, wild animals afford better opportunities for observation than the Hanúmán Monkey of Northern and Central India. Generally protected, and looked upon as sacred by many of the Hindu inhabitants, it has no fear of man and may be found in groves near villages, or even in the village trees, as commonly as in the depths of the forest. In many parts of India it is a common occurrence to see these monkeys on the roofs of houses. They frequently pilfer food from the grain-dealers' shops, whilst the damage they inflict on gardens and fields renders them so great a nuisance that the inhabitants of the country, although they will not as a rule kill the monkeys themselves, sometimes beg Europeans to shoot the intruders.

S. entellus feeds on fruit and grain, seed, seed-pods (for instance gram), leaves and young shoots, the last two forming a large portion of its food. Certain vegetable poisons are said to be taken by this monkey with impunity, doses of 5 and even 10 grains of strychnine having been given to one without effect, although the same drug killed *Macacus rhesus* quickly.

The Hanúmán is usually found in smaller or larger communities, composed of individuals of both sexes and of all ages, the youngest clinging to their mothers and being carried by them, especially when alarmed. An old male is occasionally found solitary, as with so many other mammals. The story that males and females live in separate troups, though apparently believed by Blyth and quoted by Jerdon, I agree with Hutton in regarding as fictitious, though, as the latter observer justly remarks, females with very young offspring may keep together and temporarily apart from the remainder of the troup to which they belong.

I also doubt the details of the story, quoted, like the last, from the 'Bengal Sporting Magazine' for 1836, of combats between the males for the possession of the females. But the occurrence of fights amongst these animals rests on good evidence. Mr. T. H. Hughes (Proc. A. S. B. 1884, p. 147) described a combat, witnessed by himself in April, between two communities of Hanúmáns, apparently for the possession of a mango-grove. Only the champion males of each flock engaged at first, two from the larger flock, one from the smaller; but after one of the former had been killed, his throat being torn open by his adversary's teeth, two females came to the assistance of the survivor, and the single champion of the opposite side was mortally wounded, whereupon several of the weaker flock appeared to be taken prisoners by the others. The whole account is very interesting.

Away from villages, the high trees on the banks of streams or of tanks, and, in parts of Central India, rocky hills are the favourite haunts of these monkeys. They are never found at a great distance from water. Whether on trees, on rocks, or on the ground they are exceedingly active. "They leap with surprising agility and precision from branch to branch, and when pressed take most astonishing jumps. I have seen them cross from tree to tree, a space of 20 to 30 feet wide, with perhaps 40 or 50 feet in descent. They can run on all fours with considerable rapidity, taking long strides or rather bounds" (*Jerdon*). They leap from rock to rock as readily as from tree to tree. But great as their apparent speed is, McMaster found that on horseback he easily ran down a large male in a very short distance; indeed, it is their power of bounding and the remarkable appearance they present whilst leaping, with their long tails turned over their backs, that convey the idea of speed, rather than the actual rapidity of their motions.

Their voice is loud and is often heard, especially in the morning and evening. The two commonest sounds emitted by them are a loud, joyous, rather musical call, a kind of whoop, generally uttered when they are bounding from tree to tree, and a harsh guttural note, denoting alarm or anger. The latter is the cry familiar to the tiger-hunter, amongst whose best friends is the Hanúmán. Safely esconced in a lofty tree, or jumping from one tree to another as the tiger moves, the monkey by gesture and cry points out the position of his deadly enemy in the bushes or grass beneath, and swears at him heartily. It is marvellous to observe how these monkeys, even in the wildest forests, where human beings are rarely seen, appear to recognize the men as their friends, at least as allies against the tiger. It is a common but erroneous notion of sportsmen that this guttural cry is a sure indication of a tiger or leopard having been seen, whereas the monkeys quite as often utter it merely as an expression of surprise; I have heard it caused by the sight of deer running away, and I believe that it is frequently due to the monkeys catching sight of men.

In confinement the Hanúmán is, as Jerdon says, quite sedate

and indolent. Older animals are not unfrequently morose and savage. None of this group are so docile or so amusing as the *Macaci*, and even in the wild state the Hanúmán appears quieter, less possessed by an insatiable curiosity, less sportive, and also less quarrelsome. His behaviour is more in accordance with the extreme gravity of his appearance.

The female Hanúmán is said not unfrequently to have twins, although one young at a time is the rule, as throughout the order. The period of gestation does not appear to have been ascertained, nor the age at which these monkeys become adult.

13. Semnopithecus schistaceus. *The Himalayan Langur.*

Semnopithecus schistaceus, *Hodgson, J. A. S. B.* ix, p. 1212 (1841); *Anderson, An. Zool. Res.* p. 16; *id. Cat.* p. 37.
Presbytis schistaceus, *Blyth, Cat.* p. 11; *Jerdon, Mam.* p. 6.

Lángúr, Hindi.

No crest. Fur long. The hair of the crown radiates from a point some distance behind the eyebrows, as in *S. entellus.* The ears are smaller than in that species, and concealed by the long hair of the cheeks. Tail slightly but distinctly tufted at the end.

Colour. Back, tail, and outside of limbs earthy or greyish brown, frequently with a slight purplish tinge. Shoulders and a band down the fore limbs often darker. Crown and sides of head and the lower parts whitish. Feet and hands externally the same colour as the limbs, or very little darker. Face and ears black; a little black hair on parts of the face.

Dimensions. A moderate-sized individual measures 30 inches from muzzle to rump, tail 36. An adult male skull is 5·7 inches in extreme, 4·15 in basal length, 4·35 broad. This species is the largest of the Indian and Burmese forms, and probably of the whole genus.

Distribution. Throughout the greater portion of the Himalayas from Kashmir to Bhutan, the most western authenticated locality being the Wurdwan valley above Kishtwar (J. A. S. B. xlvi, pt. 2, p. 284). In Sikhim *S. schistaceus* is confined to the interior at elevations of from 7000 to 12,000 feet. It is found at similar elevations in the Western Himalayas, but it is also said to occur at the base of the Himalayas. As stated under the last species, it remains to be seen whether the Langurs of the Terai and lower Himalayan slopes are not *S. entellus.* I can find no record, by a competent naturalist, of *S. schistaceus* below 5000 or 6000 feet.

This monkey is included in a list of mammals found in the Naga hills (J. A. S. B. xliv, pt. 1, p. 332), but probably some other species has been mistaken for it. The statement that large monkeys are found in Kafiristan (J. A. S. B. xxviii, p. 332) requires confirmation.

Habits. Except in inhabiting a much cooler climate, this Langur differs but little from the Hanúmán monkey in habits. Hutton

has observed *S. schistaceus* near Simla, sporting amongst fir trees that were loaded with snow-wreaths.

According to a MS. note of Hodgson's these monkeys pair in February and have young in April or May, the period of gestation being apparently only two months. Further information is desirable.

S. schistaceus is distinguished from *S. entellus* (1) by being somewhat larger, though there is probably no great difference between large individuals of both species; (2) by the head being much paler in colour than the back, and by the feet being but little, if at all, darker than the limbs; (3) by the smaller ears, and by their being concealed by the long hair of the cheeks; (4) by the form of the skull. Dr. Anderson has shown that the skull of *S. schistaceus* is longer in proportion to the breadth, and the face is relatively longer than in *S. entellus*. If a straight edge be applied to the face, it will be found that in *S. entellus* the nasal bones do not project beyond a line drawn from the middle of the supraorbital ridge to the anterior border of the premaxillaries, whilst in *S. schistaceus* the nasals do project beyond that line. These characters appear quite constant in adults. Anderson in his last work, the 'Catalogue of Mammalia in the Indian Museum,' classes *S. schistaceus* as merely a variety of *S. entellus*, but I cannot agree.

14. **Semnopithecus priamus.** *The Madras Langur.*

Semnopithecus priam, *Elliot, Blyth, J. A. S. B.* xiii, p. 470 (1844).
Presbytis priamus, *Blyth, J. A. S. B.* xvi, p. 732, pl. liv (p. 1271); xx, p. 153; *id. Cat.* p. 12; *Kelaart, Prod.* p. 3; *Jerdon, Mam.* p. 7.
Semnopithecus albipes, *Is. Geoff. Cat. Méth. Mam.* (1851) p. 14; *Gray, Cat. Monkeys &c. B. M.* p. 15; *Anderson, An. Zool. Res.* p. 18.
Semnopithecus priamus, *Anderson, An. Zool. Res.* p. 19; *id. Cat.* p. 38.

Konda-músal, Muskaunthi, Tam.; *Gandangi,* Tel.; *Musia,* Can.; *Kunde Wandaru,* Cing.

The radiation of the hairs on the front part of the crown is less conspicuous than in *S. entellus* and *S. schistaceus*; the hairs on the hinder part of the crown are elongated along the middle line so as to form a distinct longitudinal compressed crest*. Black supraorbital fringe very long. Ears large, not covered by the hair of the cheeks. Hair of the body long, with scattered longer piles of the same colour.

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* The existence of this crest was mentioned by Blyth, Jerdon, and Kelaart, and figured by Sir Emerson Tennant, but doubted by Anderson. It is, however, distinctly shown in three dried skins from Ceylon in the British Museum, and as these skins have never been mounted the character is clearly natural. I have also seen it in skins from Southern India, and am assured by Mr. W. Davison and others that it is constantly present.

Colour. Back, outside of limbs, and tail greyish or earthy brown, sometimes with a slight pinkish tinge; head paler brown above; feet the same colour as the limbs, or a little darker, not black.

Fig. 8.—Head of *Semnopithecus priamus.*

Lower parts pale brown. Face, palms of hands, and soles of feet black.

Dimensions. Head and body 21 inches, tail 28 (a Ceylon specimen); a large Wynaad example, however, measured 23 and 37 inches. Madras specimens are probably larger than Ceylonese. An adult male Ceylon skull is 4·23 inches in extreme, 3 in basal length, and 3·35 in zygomatic breadth. Another has for corresponding dimensions 4·6, 3·28, and 3·63 inches.

Distribution. Coromandel coast and the Carnatic as far north as Nellore, also Mysore, the Wynaad, and Northern Ceylon, extending south as far as Trincomali and the skirts of the Kandyan hills. The limits of range of this species and of *S. entellus* are not exactly known. *S. priamus*, I learn from Mr. W. Davison, ascends the eastern slopes of the Nilgiri hills to an elevation of 6000 feet.

Habits. Precisely similar to those of its near ally *S. entellus.*

This species may be distinguished from *S. entellus* by having a crest, and by the feet and hands not being black above. The form of the skull is quite different, as Anderson has shown; the facial portion being much shorter and more concave. The distance from the alveolar border of the premaxillaries to the supraorbital ridge in an adult skull of *S. priamus* is 1·7, in *S. entellus* 2·25, and in *S. schistaceus* 2·7 inches. Several other differences in the cranium and mandible are noticed by Anderson.

15. Semnopithecus hypoleucus. *The Malabar Langúr.*

Semnopithecus hypoleucos, *Blyth, J. A. S. B.* x, p. 839 (1841), xiii, p. 470; *Anderson, An. Zool. Res.* p. 20; *id. Cat.* p. 40.
Semnopithecus dussumieri, *Is. Geoffr. Comptes Rendus,* xv, p. 719 (1842); *id. Descr. An. Nouv., Fam. des Singes,* p. 54, pl. xxx.
Presbytis hypoleucos, *Blyth, J. A. S. B.* xvi, p. 733.
Presbytis johnii, *Blyth, Cat.* p. 12; *Jerdon, Mam.* p. 7, *nec Fischer.*

Vella Manthi, Malayalim.

No crest. The hair on the crown of the head radiates as in *S. entellus.*

Colour. Above dusky brown, varying somewhat in tint, sometimes not much darker than *S. entellus,* but always darker in the middle of the back than on the sides. Head fulvous to dirty yellow, the crown being rather darker. Supraorbital hairs black as usual, and some black hairs before the ears. Limbs dark brown, hands and feet black; tail dark brown, the terminal portion paler. Lower parts yellow or yellowish white. Face black. Young animals are said by Jerdon to be sooty brown throughout.

Dimensions. Smaller than those of *S. entellus.* Head and body of a full-grown male 21 inches, tail 32. An adult male skull measures 4·26 inches in extreme length by 3·30 in breadth across the zygomatic arches (*Anderson*).

Distribution. The Malabar coast, especially in evergreen forests, from about 14° or 15° North lat. to Cape Comorin, ascending the hills to an elevation of about 1200 or 1300 feet. It is not confined to the forests, but frequents gardens and the belt of cultivated wooded land that extends all along the sea-coast of Malabar.

Habits. Similar to those of *S. entellus,* except that, although it is found in trees near houses, it is not familiar and rather shuns observation. It has the usual loud call of the genus, and the same kind of alarm-note when it sees tigers or other beasts of prey. It is frequently taken young and tamed.

16. Semnopithecus johni. *The Nilgiri Langúr.*

Simia johnii, *Fischer, Syn. Mam.* p. 25 (1829).
Semnopithecus cucullatus, *Is. Geoffr. Zool. Bél. Voy.* p. 38, pl. i (1834).
Semnopithecus jubatus, *Wagner, Schreb. Säugeth. Supp.* i, p. 305.
Presbytis johnii, *Blyth, J. A. S. B.* xvi, p. 734.
Presbytis cucullatus, *Blyth, J. A. S. B.* xxviii, p. 283; *id. Cat.* p. 14.
Presbytis jubatus, *Jerdon, Mam.* p. 8.
Semnopithecus johnii, *Anderson, An. Zool. Res.* p. 21; *id. Cat.* p. 45.

Turuni, Kodan, Pershk, Toda; *Korangu,* Baduga and Kurumba; *Karing Korangu,* Mal.

Hair of the crown and sides of the head very long; no radiating centre to the crown. Fur of the body long, fine, and glossy.

Colour. Glossy black to blackish brown except the head, which is some tint of brownish yellow, and the rump and base of the tail, which are generally ashy grey in adults and occasionally in the young. In the female there is always a yellowish-white patch inside each thigh (*Davison*). The very young animal is black throughout.

Dimensions. Head and body 21 to 23 inches, tail 32 to 35; weight 23 lbs. In a very large male the head and body measured 29 inches, tail 37. Females are rather smaller than males. The above measurements are from Travancore and Animalé specimens by Mr. F. Bourdillon and Mr. T. Hornaday. The skull of a female barely adult measures 2·45 inches in basal, 3·7 in extreme length, and 2·65 in zygomatic breadth, but this is doubtless a small specimen.

Distribution. Found throughout the higher portions of the Southern Syhádri or Western Gháts from the Wynaad to Cape Comorin, not descending below 2500 or 3000 feet elevation. Common on the Nilgiri, Palnai, and Animalé hills. Not known on the Shevrai (Shevaroy) or other ranges east of the Syhádri.

Habits. This animal is shy and wary, the result of human persecution. It inhabits the sholas or dense but abruptly-limited woods of the Nilgiris and other high ranges of Southern India, and is also found in the forests on the slopes of the hills, usually in small troops of from five to ten individuals. It is very noisy, having a loud guttural alarm cry, used also to express anger, and a long loud call. Jerdon relates that when the sholas of the Nilgiri range were beaten for game, these monkeys made their way rapidly and with loud cries to the lowest portion and thence to a neighbouring wood at a lower level.

In consequence of the beauty of their skins, and the circumstance that certain castes eat their flesh, these monkeys are more frequently shot than most of the Indian species, hence their shyness.

17. **Semnopithecus cephalopterus.** *The purple-faced Monkey.*

Cercopithecus vetulus, *Erxl. Syst. Reg. An., Mam.* p. 25 (1777), *partim.*
Cercopithecus kephalopterus, *Zimm. Geog. Gesch.* ii, p. 185 (1780).
Cercopithecus leucoprymnus, *Otto, Acad. Cæs. Leop. Nova Acta,* xii, p. 505, pl. xlvi bis (1825).
Presbytis cephalopterus, *Blyth, J. A. S. B.* xvi, pp. 734, 1271; *Kelaart, Prod.* p. 1; *Blyth, Cat.* p. 13.
? Presbytis thersites, *Elliot, Blyth, J. A. S. B.* xvi, p. 1271, pl. liv, f. 3; *Blanford, P. Z. S.* 1887, p. 626.
Semnopithecus cephalopterus, *Schlegel, Mon. Singes Mus. P.-B.* p. 51; *Anderson, An. Zool. Res.* p. 22; *id. Cat.* p. 43.
Semnopithecus kelaarti, *Schlegel, l. c.* p. 52.

Kallu Wanderu (and *Elli Wanderu* ?), Cingalese.

Hair of crown directed backward, not radiating. Whiskers

very long, concealing the lower part of the ears. Black supra-orbital hairs but moderately developed. Hair of body of moderate length.

Colour. Body and limbs dusky or smoky brown to black, more or less tinged with ashy grey above and below; sacral region, comprising the lower back, posterior upper portion of thighs, and base of tail, ashy grey to greyish white, greater portion of tail darker grey, tip again paler. Hair uniformly coloured, sometimes paler towards the base, and frequently with pale tips on the back. Crown of head and nape hair-brown, much paler than the back; sides of head and chin ashy grey or white, the long whitish whiskers contrasting strongly with the brown crown, and serving at all ages to distinguish this species from *S. johni.*

Dimensions. Head and body 20 inches, tail 24½. A female skull scarcely adult is 2·5 inches in basal, 3·5 in extreme length, and 2·6 broad.

Varieties. The prevalent coloration, in adults at all events, is nearly black on the body, with the sacral region silvery grey. But in the form named *S. kelaarti* by Schlegel, which appears to be far from uncommon, the whole animal is hair-brown except the lower back, upper portion of thighs, whiskers, and chin, which are light brown or whitish. It is not known whether, specimens thus coloured are ever fully adult, but many immature specimens have the normal coloration. Examples intermediate in coloration between the black and brown forms are also met with. It is probable that the *S. thersites* of Blyth and Kelaart may have been founded on such brown examples of the present species.

It is clear that this monkey varies greatly in coloration, and although at present I am disposed, chiefly for want of accurate information, to keep the two next species, *S. senex* and *S. ursinus,* distinct, it is quite possible that Anderson (Cat. Mam. I. M. pp. 44, 45) may be right in classing all as varieties of *S. cephalopterus.*

The skulls of this species, of *S. johni*, and *S. ursinus* are said by Anderson to be very similar to each other.

Distribution. Found throughout most parts of Ceylon at low or moderate elevations, not above 1300 feet according to Kelaart. According to Layard it is the common monkey of the maritime provinces and is also found in the Kandyan districts.

Habits. Very similar to those of other species, found usually in troops of ten to fifteen individuals. In confinement it is said to be very gentle.

18. **Semnopithecus senex.** *The white Monkey.*

? Simia veter, *L. Syst. Nat.* ed. xii, i, p. 36 (1766).
Cercopithecus senex, *Erxl. Syst. Reg. An., Mam.* p. 24 (1777).
Presbytis albinus, *Kelaart, Prod.* p. 7; *id. J. A. S. B.* xx, p. 182.
Semnopithecus senex, *Schleg. Mus. Pays-Bas,* i. p. 53.
Semnopithecus cephalopterus, var., *Anderson, An. Zool. Res.* p. 23, note; *id. Cat.* p. 45.

Fur dense and wavy, whiskers full. Long white hairs over the toes.

Colour. Yellowish white, faintly marked with brownish on the head, dusky over the shoulders and on the middle of the back. Face and ears black. Soles and palms flesh-coloured.

Dimensions. Apparently the same as those of *S. ursinus.*

Distribution. Mountains of Southern Ceylon at considerable elevations.

Habits. This species or variety is said to be rare, but to be found occasionally on the Ceylonese mountains in parties of three or four, always apart from the other monkeys. Its occurrence was mentioned more than two centuries ago by Captain Robert Knox.

Although it is very possible that *S. senex* is simply a white variety of *S. ursinus* or *S. cephalopterus*, it appears equally probable that the present species may be an allied but distinct form now verging on extinction. The only specimen I have seen, a young animal in the Leyden Museum, looked somewhat different from both. I have not been able to compare the skull.

19. Semnopithecus ursinus. *The bear Monkey.*

Presbytis ursinus, *Blyth, J. A. S. B.* xx, pp. 155, 182; *id. Cat.* p. 13; *Kelaart, Prod.* p. 2.
Semnopithecus ursinus, *Anderson, An. Zool. Res.* p. 24.

Maha Wanderu, Cing.

Hair very long, 4 to 5 inches in length on the sides. Supra-orbital black hairs scarcely longer than those of crown, but coarser.

The skull is said by Anderson to be shorter, with a greater zygomatic breadth than that of *S. cephalopterus*; the face shorter, and the nasals somewhat longer, besides other distinctions; but it would be necessary to examine more specimens before concluding that these distinctions are constant.

Colour. Dusky brown almost throughout; hair on sides of face and chin paler, greyish brown to white. Hands and feet dark or black; head above in some specimens more rufous than back, and occiput grey. No grey tinge in the sacral region.

Dimensions. Larger than *S. cephalopterus.* Head and body 21 inches, tail 26, hand 5, foot 6½.

Distribution. Mountains of Southern Ceylon, especially near Newera Ellia.

Habits. According to Kelaart, these monkeys are usually seen in large numbers jumping on the trees, and when disturbed make a short howling noise. Sir E. Tennant says that "at early morning, ere the day begins to dawn, their loud and peculiar howl, which consists of quick repetition of the sound *how-how*, may be frequently heard in the mountain jungles." One of these animals has been known to attack a coolie carrying a rice-bag. The flesh of this monkey, as of *S. johni*, is eaten by certain castes of natives.

20. **Semnopithecus pileatus.** *The capped Monkey.*

Semnopithecus pileatus, *Blyth, J. A. S. B.* xii, p. 174 (1843), xiii, p. 467; *Anderson, An. Zool. Res.* p. 13; *id. Cat.* p. 40.
Presbytis pileatus, *Blyth, J. A. S. B.* xvi, p. 735; *id. Cat.* p. 12; *id. Mam. Birds Burma,* p. 11.

Fig. 9.—Head of *Semnopithecus pileatus.*

The crown of the head thickly covered with hair of equal length, rather longer than that of the occiput and temples and harsher than that of the back, all directed backwards and forming a distinct cap. There is no frontal radiation. Hair of cheeks long, partially covering the ears. Black supraorbital hairs well developed.

Colour. Upper parts dusky grey to brownish ashy grey, darker on the upper part of the back and sometimes on the crown of the head; the hands and feet dark brown or black above, the fingers or some of them occasionally yellow; tail dark brown or black towards the tip. Sometimes the upper parts have a ferruginous tint. Lower parts and sides of head and neck golden brown or orange to pale yellow or yellowish white. The yellow or whitish colour of the cheeks extends to a line drawn just above the ears, and the sides of the neck behind the ears are also pale, so that the dark cap is well defined. Face black.

Blyth states that females and young have the lower parts white or but faintly tinged with ferruginous and the upper parts pure grey, whilst old males are of a deep rust-colour below and on the cheeks. In most specimens, however, the lower parts are of some shade of yellow, more or less pure.

Dimensions. Less than *S. entellus.* An immature female measured:—head and body 18 inches, tail without the tuft of hair at

the end 28·5, with the tuft 31 (*Blyth*). According to Anderson the skull is of about the same size as that of *S. priamus*, but the supraorbital ridge is less developed.

Distribution. Throughout Assam and the hills to the south of the valley, Sylhet, Tipperah, Chittagong, Northern Arakan, and part of Upper Burma. Neither this nor any other species appears yet to have been recorded from the Himalayas north of Assam. Anderson gives Tenasserim also as a locality, but this is due to his uniting *S. chrysogaster* with this species.

Habits. Nothing is known of the habits of this species in particular, though it doubtless resembles its allies in most respects. In captivity it is said to be gentle when young; but older animals, especially males, are sometimes savage.

21. **Semnopithecus chrysogaster.** *The red-bellied Monkey.*

Semnopithecus potenziani, *Bonaparte, Comptes Rendus,* xliii, p. 412, note (1856), description insufficient.

Semnopithecus chrysogaster, *Licht., Peters, P. Z. S.* 1866, p. 429, footnote; *id. MB. Akad. Berlin,* 1879, p. 830, footnote, pl. iv *b* (no description, but a good figure).

Presbytes chrysogaster, *Blyth, Mam. Birds Burma,* p. 10.

In the only specimen known there is a slight compressed crest extending from the vertex to the nape, but there is some doubt as to whether this crest is natural; probably it is. No distinct whisker-tufts. Chin thinly covered with short white hairs and a few on the upper lip. Fur of body rather long.

Colour. Upper parts, limbs, and tail jet-black, the basal half of the dorsal hairs ferruginous, the extreme base white; the frontal band, the cheeks to behind the ears, sides and front of neck, with chin and upper breast, white; rest of lower parts deep and bright ferruginous, which tinges the inner side of the limbs.

Young wholly rufous white or pale isabelline.

Dimensions of stuffed adult specimen (a female): head and body 20 inches long, tail 23.

Two specimens, an adult female and a young one, are preserved in the Berlin Museum. According to Blyth, these were obtained by Helfer in Tenasserim. Peters says nothing of Helfer, nor could I learn anything in Berlin of the original collector of the specimens, although on the stand, besides the locality, is the name Prof. Strempel. The circumstance that so beautifully coloured and conspicuous a species has not been noticed again tends to raise some doubt as to the species really occurring in Tenasserim. At the same time, *Sciurus piceus*, said by Peters (P. Z. S. 1866, p. 429, note) to have been received with *Semnopithecus chrysogaster*, appears to be identical with a variety of *Sciurus erythræus* that occurs in Cachar.

22. Semnopithecus barbei. *Barbe's Leaf-Monkey.*

Presbytis barbei, *Blyth, J. A. S. B.* xvi, p. 734; *id. Cat.* p. 14; *id. Mam. Birds Burma*, p. 11.
Semnopithecus barbei, *Anderson, An. Zool. Res.* p. 12; *id. Cat.* p. 48.

No crest. Hair on the crown not radiating. Whiskers long. Beard short. Hair on the vertex slightly lengthened, but not so distinctly as in *S. obscurus*.

Colour. Blackish brown to black above and below, with a silvery greyish wash on the upper parts and outside of limbs. Eyebrows and whiskers black. Naked face bluish black.

Dimensions. Head and body 19·5 inches, tail 29.

Distribution. The types were from the interior of the Tipperah hills. This species has also been obtained by Anderson on the Irawadi just above Mandalay in Upper Burma, and further north in the Kakhyen Hills, and by Mr. Ossian Limborg on Muleyit mountain west of Moulmain in Tenasserim. Mr. Limborg's specimens have been identified by Dr. Anderson, but require comparison with the monkey from the same neighbourhood identified as *S. phayrei* by Colonel Tickell.

Habits. Similar to those of other members of the genus. Anderson observed this monkey in parties of from thirty to fifty. They were not shy.

It is possible that this species, of which I have not been able to examine specimens, is only a variety of *S. obscurus*. This was Blyth's view at one time (J. A. S. B. xxiv, p. 711), and Anderson (*l. c.*) has shown that there is much similarity in the skulls of these two forms. Both have rounded orbits and a comparatively elongate interorbital region. Blyth, in his Catalogue and in his list of Burmese Mammals, however, classed *S. barbei* as closely allied to *S. femoralis*, if not identical. This scarcely appears to me borne out by the description.

23. Semnopithecus phayrei. *Phayre's Leaf-Monkey.*

Semnopithecus obscurus, *Blyth, J. A. S. B.* xiii, p. 466, *nec Reid.*
Presbytis phayrei, *Blyth, J. A. S. B.* xvi, p. 733 (1847); *id. Cat.* p. 15.
Semnopithecus argentatus, *Blyth, Horsfield, Cat.* p. 7.
Presbytis cristatus, *Raffles, apud Blyth, Mam. Birds Burma*, p. 9, *nec Raffles.*
Semnopithecus phayrei, *Anderson, An. Zool. Res.* p. 34; *id. Cat.* p. 49.

Myouk-myek-kweng-hpyu (monkey with white orbits), Burm.; *Myouk-hgnyo*, Arakan and Tavoy; *Geng*, Talain; *Dáthwa* and *Shawá me*, Karen.

A somewhat peaked, longitudinal median crest on the vertex. Hair of crown elongated, directed backwards, not radiating. Whiskers long, partly covering the ears. In the skull the supra-orbital ridges are but little developed, and the orbits are less

rounded than in *S. barbei* and *S. obscurus*. The occipital region is nearly vertical.

Colour. Above dark ashy brown, darkest on the head and extremities, including the tip of the tail, the basal portion of which is albescent. Back from shoulders to loin silvery, or glistening. Whiskers same colour as crown. Underparts whitish or white, this colour not extending on to the limbs. Eyelids and a broad area above the eyes whitish or white; an area including the mouth

Fig. 10.—*Semnopithecus phayrei*. (From a drawing by Col. Tickell.)

and lips, and extending from the nostrils to the chin, flesh-colour; hairs around mouth white; remainder of face leaden black.

Young the same colour as adults; the very young are, however, straw-coloured according to Tickell.

Dimensions. An adult female, according to Tickell, measured: head and body 23 inches, tail 30, hand $4\frac{3}{4}$, foot 6. Anderson gives much smaller measurements: head and body 18·2 inches, tail 21·2.

Distribution. Arakan, the Bassein district of Pegu west of the Bassein river, where I shot this monkey myself, and Northern Tenasserim, near Moulmain, where the same species apparently was obtained by Tickell (J. A. S. B. xxviii, p. 428, and MS. notes) and by Mr. W. Davison.

In Tickell's unpublished notes there is an excellent coloured drawing and description with several details of anatomy &c., taken from an adult female that he obtained east of Moulmain. The drawing, from which the accompanying cut is taken, represents an animal greyer in colour than Arakan specimens, and the hands and feet are blackish above, contrasting strongly with the colour of the limbs. The lower parts are white on the lower abdomen and inside the thighs only; elsewhere they are ashy grey. This animal may have been an example of *S. albocinereus*, Desm. (*S. siamensis*, Müll. & Schl.), but I am rather disposed to refer that species to *S. femoralis*.

Habits. Phayre's Leaf-Monkey is found in dense high forests, or amongst bamboos on the hill-sides and on the banks of streams, usually in flocks of twenty or thirty individuals. It is very shy and wary, and is consequently more often heard than seen, the whole flock when alarmed rushing through the forest, shaking the branches violently and leaping from tree to tree. But occasionally, as Tickell observes, an old male stays behind in a safe post of vantage on the top of one of the highest trees, where he may be heard uttering his short deep alarm-cry at frequent intervals. This cry is an angry bark not unlike that of the Hanúmán. I was once well scolded from a tree by an old monkey, I believe of this species, on the edge of a half-deserted clearing in Southern Arakan. I had done nothing to offend his monkeyship, but he evidently considered me as something unusual and suspicious. Blyth observes that the young of this species, besides making a whining noise to express their wants, emit a cry that might be mistaken for the mew of a cat.

24. **Semnopithecus obscurus.** *The dusky Leaf-Monkey.*

Semnopithecus obscurus, *Reid, P. Z. S.* 1837, p. 14 (no description); *Anderson, An. Zool. Res.* p. 25; *id. Cat.* p. 46; *Thomas, P. Z. S.* 1886, p. 66.

Presbytis obscurus, *Blyth, Cat.* p. 14; *id. Mam. Birds Burma*, p. 10.

Lotong or *Lotong-itam*, Malay.

Hair of crown directed backwards, not radiating, becoming lengthened at the back, so as to form a pointed projecting tuft on the occiput. Whiskers long.

Colour. As a rule dark ashy grey on the head, body, and limbs, varying, however, to blackish brown; feet and hands black; lower parts rather paler; tail as a rule lighter than the body. The lengthened hair on the occiput conspicuously paler, sometimes

whitish. The nape and sometimes the middle of the back often brownish. Mouth and eyelids whitish, remainder of face black.

A female obtained by Mr. Davison at Bánkasún, in the extreme south of Tenasserim, has the crown of the head and middle of the back hair-brown, sides almost black; long hair of occiput, limbs, tail, and underparts brownish grey; feet black above, as usual.

The young are of a vivid golden ferruginous colour, which soon changes to dusky ash, the rufous colouring remaining longer on parts of the head, throat, flanks, and thighs, and longest of all on the terminal portion of the tail. Probably the female described above retained the coloration of the young on the limbs and tail.

Dimensions. In an adult male the head and body measured 21 inches, tail 32. An adult male skull from Tenasserim * in the British Museum measures in extreme length 4·25, basal length 3, and zygomatic breadth 3·5. In an adult female skull the corresponding dimensions are 3·8, 2·7, and 2·85 inches.

Distribution. Malayan Peninsula, Siam, and the Tenasserim provinces.

25. **Semnopithecus femoralis.** *The banded Leaf-Monkey.*

Semnopithecus femoralis, *Horsfield, Appendix Life Sir T. S. Raffles,* p. 642 (1830) (no description); *Martin, Charlesworth's Mag. N. H.* ii, p. 436 (1838); *Cantor, J. A. S. B.* xv, p. 175; *Horsf. Cat.* p. 10; *Anderson, An. Zool. Res.* p. 30; *id. Cat.* p. 52; *Thomas, P. Z. S.* 1886, p. 66.

Two distinct radiating centres, one on each side of the forehead behind the supraorbital ridge. Hair of the occiput elongate, forming a crest as in *S. obscurus.*

Colour. Blackish brown to black, except upon a varying portion of the under surface, which is white, and always includes the lower abdomen and inside of the thighs. Sometimes the latter colour extends only to the knee, in other specimens it passes down the inside of the leg to the heel, and also occupies the centre of the chest, the inside of the arm, and the lower surface of the tail except near the tip.

Dimensions. Anderson gives head and body 19 inches, tail 22; but no measurements from fresh individuals are available.

Distribution. Borneo, Sumatra, and the Malay Peninsula, extending north into Tenasserim. A specimen was obtained by Mr. Davison at Bánkasún in South Tenasserim.

Nothing is recorded of the habits of this species.

I am strongly disposed to suspect that *S. siamensis,* Müll. & Schleg. (*S. albocinereus* apud Cantor), is a grey form of this species.

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* This is one of a large collection of Indian skulls in the British Museum labelled as presented by the late Dr. Oldham. The collection was made by Mr. W. Theobald, and entrusted by him to Dr. Oldham for presentation to the Museum.

Suborder *LEMUROIDEA.*

The Lemurs or Half-Apes, *Prosimiæ* of some authors, differ so widely from the Monkeys, both externally and anatomically, as to have been classed by many naturalists in a distinct order. The principal distinctions are the form of the skull and teeth, the greater extent to which the cerebellum is uncovered by the cerebrum, the greater development of the pollex, and the long claw-shaped nail on the second digit of the foot in Lemurs, and the presence in these animals of a perforate clitoris, a two-horned uterus, and a bell-shaped, diffuse, and non-deciduate placenta. The skull in Lemurs has a long narrow muzzle; the orbits are not surrounded by bone behind, as in Monkeys, but open freely beneath the bony orbit into the temporal fossa; and the lachrymal foramen, instead of being internal, opens on the outside of the skull. The upper incisors are, in nearly all Lemurs, divided by a toothless interspace in the middle of the upper jaw; and the lower incisors are long, narrow, and projecting; whilst the lower canines are, in most of the forms, only distinguished from the incisors by greater depth, and have been, by several writers, counted as incisors. In most species, too, the anterior or first lower premolar is larger than the second and third, and resembles a canine, whilst the other premolars and molars are very different in shape from those in all the Old-World Monkeys (those of the Marmosets are intermediate in form), being more or less ovate in section instead of rectangular. Most of the characters enumerated as distinguishing the Lemurs are found also in other and lower orders of Mammalia. (For additional details on the *Lemuroidea*, see Mivart, P. Z. S. 1873, p. 503, and 'Encyclopædia Britannica,' article "Lemur.")

The *Lemuroidea* are divided into three families—*Lemuridæ*, comprising the greater number of the genera; *Tarsiidæ*, consisting of a single genus and species, *Tarsius spectrum*, found in the Malay Archipelago, but not known to occur on the continent of Asia; and *Chiromyidæ*, also comprising a solitary representative only, the Aye-Aye of Madagascar. The first family is alone represented in South-eastern Asia.

Family LEMURIDÆ.

Two genera occur within our area, all the others are restricted to Africa and Madagascar, the majority being peculiar to the last-named island. The two found in India, Ceylon, and Burma are thus distinguished:—

I. Either only two upper incisors, or four of unequal size; the inner pair much larger than the outer. Tail present, but very short. Limbs not remarkably slender.. NYCTICEBUS.
II. Four small upper incisors of equal size. Tail none. Limbs very slender.................................... LORIS.

The lemurs of the Oriental region afford one of the most remarkable and interesting examples of geographical distribution known. The nearest allies of *Nycticebus* and *Loris* are two genera, *Perodicticus* and *Arctocebus*, found only in West Africa. *Nycticebus* has an extensive range east of the Bay of Bengal, but has not been recorded from the Himalayas; *Loris* is peculiar to Southern India and Ceylon.

Genus **NYCTICEBUS**, Geoffroy, 1812.

Syn. *Stenops*, v. d. Hoeven.

Head short; limbs moderately stout; body slender; tail very short; ears short, rounded, and covered with hair; eyes large and approximate; second digit of both hand and foot very short, that of the foot with a long claw, all the other digits with a broad nail.

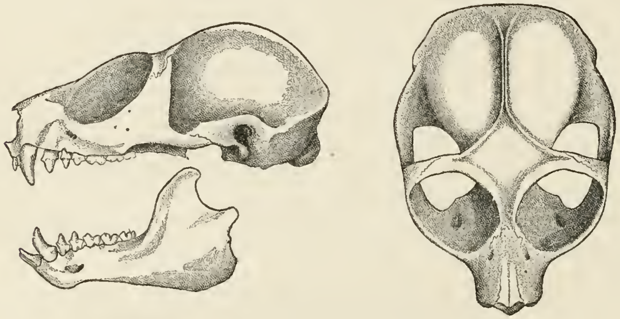

Fig. 11.—Skull of *Nycticebus tardigradus.*

The skull is globular behind; the muzzle produced, but not very narrow anteriorly; orbits large. The greatest breadth of the skull is across the zygomatic arches. Vertebral formula: C. 7, D. 16–17, L. 6–8, S. 3, C. 11–12.

Dentition: i. $\frac{1-1}{4}$ or $\frac{2-2}{4}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{3-3}$, m. $\frac{3-3}{3-3}$. When there are two pairs of upper incisors, the inner are much larger than the outer. The last upper molar has but three well-developed tubercles, two outer and one inner.

26. **Nycticebus tardigradus.** *The slow Loris.*

Lemur tardigradus, *L. Syst. Nat.* p. 44 (1766), excl. syn.
Nycticebus bengalensis, *Geoffr. Ann. Mus.* xix, p. 164 (1812).

Nycticebus tardigradus, *Blyth, Cat.* p. 18; *Jerdon, Mam.* p. 14; *Anderson, Cat.* p. 94.

Nycticebus cinereus, *A. Milne-Edw. Nouv. Arch. du Mus.* iii, 1867, *Bull.* p. 11, pl. 3; *Anderson, An. Zool. Res.* p. 103; *id. Cat.* p. 94.

Sharmindi billi (bashful cat), H.; *Lajjar* or *lajjawoti bánar* (bashful monkey), Bengali; *Myouk-moung-ma* (monkey's concubine), Burmese; *Myouk hlioung,* Tavoy; *Kasyng,* Talain; *Tacheng,* Karen; *Kúkang* and *Bruh-samúndi,* Malay.

Fur very close and woolly, covering the whole body and face with the exception of the nose and lips. The short hairy ears and the short tail are almost concealed beneath the fur. As a rule, there are four incisors in the upper jaw, but one or both of the outer pair may be wanting.

Fig. 12.—*Nycticebus tardigradus,* Tenasserim variety. (From a drawing by Col. Tickell.)

Colour. There are two principal varieties, differing in colour and somewhat in size, found in the countries east of the Bay of Bengal. The more common and larger of the two is that called *N. bengalensis* by Geoffroy, and *N. cinereus* by A. Milne-Edwards, and is the var. A of Blyth's Catalogue. This is ashy grey above, and rather paler below, more or less silvery on the back, and often rufescent on the rump, the fur being dark ashy at the base. A

chestnut-brown stripe runs down the back from the crown to the loins, but does not expand into a broad patch on the crown. Each eye is surrounded by a dark brown circle, broadest above; a narrow space in front between the two orbital rings is whitish or white. A small oval patch, including each ear, is also brown. Nose and soles of feet flesh-coloured where naked.

The other variety is, as a rule, smaller and rufescent grey above, paler below; the dorsal stripe is broader, and often deep rich brown; it usually expands into a broad rufous expanse on the crown, including the ears but not the eyes, which are always surrounded by a brown ring.

A third form is figured from Tenasserim by Tickell, from whose drawing the accompanying cut is taken. In this, which is pale rufescent, the dorsal stripe simply bifurcates on the forehead, one band running to the circle round each eye.

This leads to the type known as *N. javanicus*, in which there are four brown bands running down the head and face from the crown, one to each eye and one to each ear; the interspaces pale, and those between the eyes white. This variety, or race, is said to be peculiar to Java, and rather smaller in size than the others, and to have almost constantly only two upper incisors. Schlegel, too, states that it has eight lumbar vertebræ instead of six. It is very doubtful, however, if any of these distinctions are constant.

Dimensions. An adult male from Upper Burma, according to Anderson, measured: head and body 13·2 inches long, tail 0·75, fore limb and foot 7·2, hind limb 9. Jerdon gives a greater length, 14·5 to 16 inches. All these are taken from the large northern variety. A Tenasserim adult male, measured by Tickell, was 12·75 inches long. Two adult skulls measure 2·5 and 2·65 inches in extreme length, 2·2 and 2·3 in basal length, 1·7 and 1·8 broad across the zygomatic arches. A Javanese skull is only 2·15, 1·85, and 1·55 inches in the three dimensions.

Distribution. Throughout the countries east of the Bay of Bengal—Burma, Malacca, Siam, and the islands of Sumatra, Java, and Borneo. Common in Assam, Sylhet, &c., and extending west to the neighbourhood of Rangpur and Dacca, but not found in the Himalayas.

Habits. Purely nocturnal and arboreal. This animal feeds on leaves and shoots of trees, fruits, insects, birds' eggs, and young birds. It has been observed by Tickell to raise itself on its hind legs and throw itself upon an insect. As a rule it is silent, or only utters a feeble crackling sound, but when angry and about to bite it emits a tolerably loud growl or grunt. When captured, it is at first apt to be savage and prone to bite, but soon becomes very gentle and docile.

Tickell, from whose MS. the above notes are chiefly derived, says:—"This animal is tolerably common in the Tenasserim provinces and Arakan, but, being strictly nocturnal in its habits, is seldom seen. It inhabits the densest forests, and never by choice leaves the trees. Its movements are slow, but it climbs readily,

and grasps with great tenacity. If placed on the ground, it can proceed, if frightened, in a wavering kind of trot, the limbs placed at right angles. It sleeps rolled up in a ball, its head and hands buried between its thighs, and wakes up at the dusk of evening to commence its nocturnal rambles. The female bears but one young at a time."

Genus **LORIS**, Geoffroy, 1796.

Head short; nose narrow; body slender; limbs very slender and long; tail wanting; ears larger than in *Nycticebus*, rounded, and naked towards the margin; eyes very large and close together.

Skull with orbits that are very close together, merely separated by a very thin bony plate, and so large that the breadth across the orbits is greater than that across the zygomatic arches; muzzle narrow anteriorly. Vertebræ: C. 7, D. 15, L. 8, S. 3, C. 6–8.

Dentition: i. $\frac{2-2}{4}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{3-3}$, m. $\frac{3-3}{3-3}$. The upper incisors all small and of equal size. Hindmost upper molar with four well-developed tubercles.

Fig. 13.—*Loris gracilis.*

27. **Loris gracilis.** *The slender Loris.*

Loris gracilis, *Geoffr. Magasin Encyclopédique,* An 4e (1796), t. i, p. 48; *Blyth, Cat.* p. 19; *Jerdon, Mam.* p. 15; *Anderson, Cat.* p. 97.
Stenops gracilis, *Kelaart, Prod.* p. 9.

Devánga-pilli, Tel.; *Tevángu,* Tam.; *Nala* and *Adavi-manushya,* Can.; *Chinge-Kuli,* Kurg; *Una happolava,* Cing.

Fur very close, soft, and rather woolly; ears thin, rounded, naked towards the edge, of moderate size, considerably larger and more conspicuous than in the slow Loris.

Colour. Dark earthy grey, more or less rufescent above and on the outside of the limbs, often with a silvery wash. Dorsal fur whitish (occasionally ashy near the skin), with a blackish ring near the end and white tips. Lower parts much paler. Some specimens of the young are much more rufous, almost ferruginous. A narrow white stripe between the eyes expanding into a broader area on the forehead; sides of face, including the eyes, darker.

Dimensions. Length of head and body about 8 inches, arm 5, leg 5·6. Skull of an adult 2 inches long from occiput to end of nasal bones, which project beyond the premaxillaries; basal length 1·5; breadth 1·25 across the orbits, 1·2 across the zygomatic arches.

Distribution. Southern India and Ceylon, in the lowland forests, not, so far as is known, at any considerable elevation above the sea. This species does not appear to have been recorded as far north as the Godavari valley. It may probably be found on the West coast of India, in the Southern Concan, near Ratnagiri, but even this is not clearly ascertained. According to Jerdon, it appears to be rare on the Malabar coast, but common in the forests of the "Eastern Gháts" (probably the hills south of the Kistna river).

Habits. Very similar to those of *Nycticebus tardigradus*, except that the slender Loris is rather quicker in its movements, though still slow in general. Like its ally, it is purely nocturnal and arboreal; living upon shoots and young leaves, insects, birds' eggs, birds, and lizards. It is said to be very fond of honey or syrup. It sleeps rolled up in a ball with its head between its legs, grasping its perch with its arms.

According to Jerdon, numbers are occasionally brought to the Madras market. The eyes are a favourite remedy of the Tamul doctors for certain eye-diseases.

Order CARNIVORA.

Whether the members of the great group of flesh-eating Mammals, comprising cats, civets, ichneumons, hyænas, dogs, weasels, badgers, otters, racoons, bears, seals, and their allies, are structurally inferior to the Primates or not, is a question on which some difference of opinion exists; but there can be no question as to the superiority of organization shown by the higher Carnivora when compared with any other mammalian order, except that containing Man and the anthropoid Apes. The superiority is quite as well marked in the development of the brain as in that of the body and limbs.

The Carnivora are animals with never less than four toes on each foot, all the toes being armed with claws. The pollex and hallux are never opposable. The teeth comprise incisors, canines, and molars. The incisors are, with very few exceptions, three on each side of each jaw—the outer, especially in the upper jaw, being larger than the others. The canines are well developed. There is a milk-dentition. The condyle of the lower jaw is a transverse half-cylinder, working in a glenoid fossa of corresponding form, hence the movement of the jaw is only up and down, not lateral. The stomach is simple. The cæcum is short or absent. The uterus is bicornuate; the placenta deciduate, and often zonary. The mammæ are abdominal. The clavicle is often absent, and when present imperfect. In many forms there is a bony septum inside the skull, between the cerebrum and cerebellum.

There is but little difference of opinion amongst naturalists as to the limits of the Carnivora; the only point on which the agreement is imperfect is as to whether the seals should be included in the order or classed separately. When they are included, as in the system here followed, they form a separate suborder, called *Pinnipedia*, distinguished by having the whole external form modified for an aquatic life, the hind feet especially being converted into paddles. The teeth of the molar series, both premolars and molars, are similar to each other in size and form. Nearly all seals inhabit cold climates, and none are found in India or the neighbouring countries. The *Carnivora vera* or *Fissipedia* are fitted for a terrestrial or partially terrestrial life, and have the teeth of the molar series in each jaw dissimilar in size and form, there being always one tooth on each side, above and below, that is especially modified, and that is, in the majority of the families, larger than the other teeth: this is the sectorial, carnassial, or flesh-tooth.

The teeth in front of it are more or less sharp, pointed, and compressed; those behind are broad and tuberculated. The sectorial in the upper jaw is the hindmost premolar, and consists of a more or less compressed bicuspid or tricuspid crown on two roots and an inner lobe supported by a third root. In the *Ursidæ*, in which the sectorial teeth are ill-developed, the inner lobe and root are wanting. The lower sectorial is the first true molar, and consists of two roots supporting a bilobed compressed crown, with, in general, a keel and an inner tubercle; both of which, however, are wanting or rudimentary in the most specialized *Carnivora*, as the *Felidæ*.

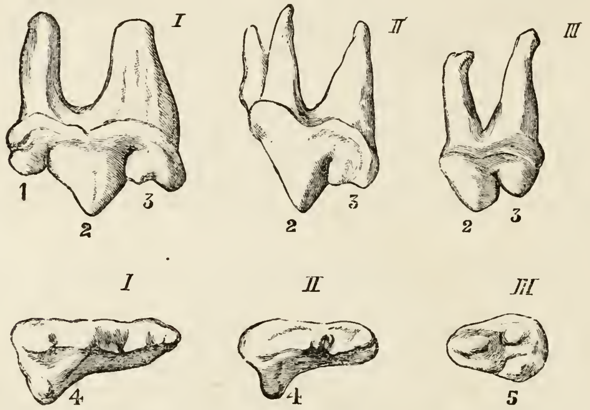

Fig. 14.—Upper sectorial teeth of I. *Felis*, II. *Canis*, III. *Ursus*. (Flower, Art. Mammalia, 'Encyclopædia Britannica.').—1, anterior, 2, middle, 3, posterior cusp of blade; 4, inner lobe supported on distinct roots; 5, inner lobe posterior in position, and without distinct root, characteristic of the *Ursidæ*.

Suborder *FISSIPEDIA*.

As already mentioned, the limits of this suborder (or order according to some writers) are generally admitted; but the subdivision into sections and families is difficult, owing to the complicated relationships between the different genera. The majority live entirely upon animal food; but a few, like the bears, feed on a mixed diet, of which vegetables form a portion. A considerable number, as the cats and dogs, walk on their toes, and are known as Digitigrade, whilst others, for instance the bears, rest upon their palms (*palma*) and soles (*planta*) and are distinguished as Plantigrade; a somewhat intermediate mode of progression, found in the weasels, otters, and badgers, being termed Semiplantigrade. This distinction has been extensively employed in classification, but is defective, for *Paradoxurus*, *Arctictis*, and *Cryptoprocta* are more or less plantigrade, although in other respects much more nearly

allied to the digitigrade cats and civets than to any of the plantigrade or subplantigrade Carnivora. Mr. H. N. Turner * and Professor Flower † have proposed to divide the order into three sections, named *Æluroidea*, *Cynoidea*, and *Arctoidea*, from the Greek names of the cat, dog, and bear respectively, each of these animals being typical of a particular section, and the distinctive characters being taken principally from the base of the skull and the development of a cæcum. Some other characters taken from the generative organs support this classification, which is employed in the following table. The accompanying cut of part of a wolf's skull will serve to illustrate the distinctions mentioned, and a dog's or jackal's skull will be found precisely similar in all essential points to a wolf's, and will serve for comparison.

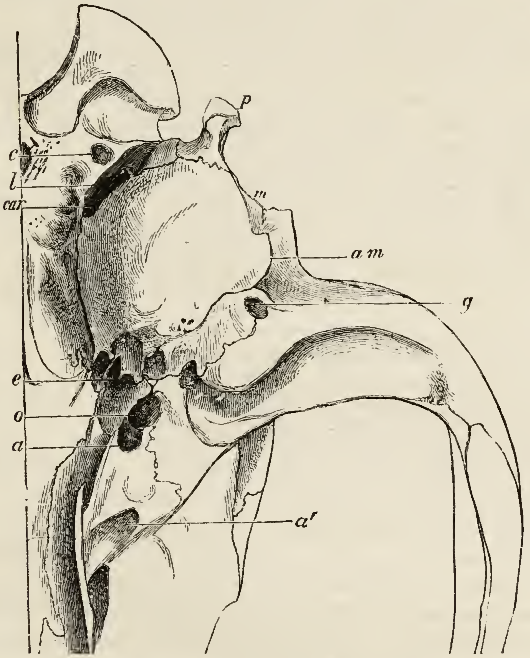

Fig. 15.—Part of the base of the skull of a Wolf (*Canis lupus*). (Flower, P. Z. S. 1869, p. 25.)

c. The condyloid foramen. *l*. The foramen lacerum posticum. *car*. The carotid canal. *e*. The eustachian canal. *o*. The foramen ovale. *a*. The posterior, and *a′*, the anterior opening of the alisphenoid canal. *p*. The paroccipital process. *m*. The mastoid process. *a.m*. The external auditory meatus. *g*. The glenoid foramen.

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* P. Z. S. 1848, p. 86.

† P. Z. S. 1869, p. 4. This paper contains numerous details of anatomy.

A. Auditory bulla much dilated, rounded, and (except in *Hyænidæ*) divided into two chambers by a septum. Bony auditory meatus short. Paroccipital process flattened against the bulla and (except in *Hyænidæ*) not projecting behind. Condyloid and glenoid foramina concealed or wanting. Cæcum small.................... **ÆLUROIDEA** *.

a. Head short; 3 or 4 teeth in upper molar series, 3 in lower; dorsal vertebræ 13; claws sharp, curved, and (except in *Cynælurus*) completely retractile. Toes 5—4 .... 1. **Felidæ.**

b. Head elongate; 5 or 6 teeth in molar series of each jaw; claws variable. Toes usually 5—5. 2. **Viverridæ.**

c. Head elongate; 4 teeth in upper molar series, 3 or 4 in lower, all small and widely separated; claws blunt. Toes 5—4 .... **Proteleidæ.**

d. Head slightly elongate; 5 teeth in upper molar series, 4 in lower; dorsal vertebræ 15; claws blunt, not retractile. Toes 4—4 .... 3. **Hyænidæ.**

B. Auditory bulla much dilated, rounded but not divided. Bony auditory meatus short. Paroccipital process flattened against bulla, but projecting behind. Condyloid and glenoid foramina distinct. Cæcum elongate, and generally folded on itself....................... **CYNOIDEA.**

a. Premolars $\frac{4-4}{4-4}$, true molars variable ($\frac{2-2}{2(3)-2(3)}$ in all Indian forms); claws exserted, blunt, non-retractile. Toes 5—4 (except in *Lycaon*) 4. **Canidæ.**

C. Auditory bulla not rounded nor divided, most prominent on inner border and sloping thence forwards, backwards, and outwards, flattened off towards the meatus, the lower lip of which is prolonged. Paroccipital process prominent, quite free from bulla. Condyloid and glenoid foramina distinct. No cæcum. Toes 5—5 .. **ARCTOIDEA** †.

a. True molars $\frac{1-1}{2-2}$ (one tubercular molar behind the sectorial above and below). No alisphenoid canal .... 5. **Mustelidæ.**

b. True molars $\frac{2-2}{2-2}$ (two tubercular molars in upper jaw, one in lower, behind sectorial) .. 6. **Procyonidæ.**

c. True molars $\frac{2-2}{3-3}$. An alisphenoid canal .... 7. **Ursidæ.**

Of the above-named families one only, *Proteleidæ*, containing a single species, *Proteles cristatus*, peculiar to Southern Africa, is not found in the Indian region. The remaining seven are represented.

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* For anatomical details of classification see Mivart, P. Z. S. 1882, pp. 135, 459.

† For anatomical details see Mivart, P. Z. S. 1885, p. 340.

ÆLUROIDEA.

Family FELIDÆ.

This, the most typical and highly specialized group of flesh-eating mammals, and that to which the term "beasts of prey" is especially applicable, comprises the various kinds of cat, all of which, despite great differences in size, are closely allied and resemble each other in almost all details of structure. In the cat, the whole organism is peculiarly adapted for the capture and killing of other animals for food; the armature of teeth and claws, the power of speed for a short distance, the excessive muscular development and activity, are all combined to enable a feline to seize and kill animals, in some cases, superior in size to itself *.

The cats are distinguished from all other families of *Carnivora* by having a rounder head and more highly specialized teeth; the canines and sectorial, or flesh-teeth, in particular being highly developed weapons for cutting and tearing, whilst the remaining teeth of the molar series are poorly developed. The claws also are adapted for inflicting severe wounds, and are applied to the armature of a foot worked by powerful muscles, and, in the case of the fore legs, with unusual freedom of action, as may easily be seen by comparing the movements of a cat's fore limb with those of a dog's. The vertebræ are C. 7, D. 13, L. 7, S. 3, C. 13–29. There is no alisphenoid canal.

The dental formula in the *Felidæ* is i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{2-2}$ or $\frac{2-2}{2-2}$, m. $\frac{1-1}{1-1}$. The outer incisors are much larger than the others, especially in the upper jaw. The canines have, in many species, a sharp hinder edge. The anterior upper premolar is small, has a single root (except in *F. planiceps*), and is often lost in old skulls, whilst it is always wanting in the adults of some species, as in *F. rubiginosa* and the Lynxes. The second upper premolar is two-rooted, pointed, with a large central lobe preceded by one small cusp and followed by two. The third upper premolar, the sectorial or flesh-tooth, is by far the largest of the molar series, and bears three roots or fangs, with a crown consisting normally of four lobes, three along the inner margin and an inner lobe, the development of which varies in different species. The hindmost tooth is the true molar, which is small, bears two roots and a flattened crown, and is placed with its longer axis nearly at right angles to that of the premolars. This tooth, like the anterior premolar, is often lost in old animals.

The teeth of the molar series in the lower jaw consist of two premolars, similar in shape, each being, like the second upper premolar, quadricuspid, with two roots, the anterior premolar rather smaller than the other; behind these is the sectorial, or

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* For a complete account of the cat's anatomy, see Dr. St. George Mivart's work entitled 'The Cat,' published in 1881.

true molar, with two roots and two nearly equal lobes, each ending in a point, the points diverging but connected by a sharp cutting-edge. There is sometimes a rudimentary hinder tubercle or "talon."

The deciduous or milk-teeth are of course much smaller; but resemble in form the permanent teeth that succeed them, with the exception of the second milk-molar in each jaw and the third in the upper. The second upper milk-molar is three-fanged, and much resembles in form the permanent third premolar or sectorial, whilst the third milk-molar resembles the upper true molar in shape, but is relatively larger. The second lower milk-molar somewhat simulates the lower first true molar or sectorial, but the anterior lobe is smaller than the second, and behind the latter are two posterior tubercles.

The claws are perfectly retractile (partially in *Cynælurus*). The terminal or third phalanx of each digit is attached to the side, not the end, of the second, and is drawn back by a retractor ligament attached to the proximal end of the third phalanx, and passing through a bony sheath on the first phalanx.

All cats are truly digitigrade. The pollex, or thumb, is well developed and has a large claw, but is not used in walking, being more proximally situated than the other digits. There is no hallux. There is a thick pad for each toe, that for the pollex being smaller than the others, and a large median pad between the four toes on each foot. A seventh small pad exists on the fore leg on the outer palmar surface of the metacarpus.

The organs of sight and hearing are well developed and the senses acute. The long vibrissæ, commonly called whiskers, are delicate organs of touch. The tongue is covered with rough papillæ directed backwards, and adapted to remove flesh from bones. The intestines are comparatively short, being from twice to five times the length of the body.

Cats are found in all the Continents, but are wanting in the Australian and Madagascar regions.

The *Felidæ* comprise only two genera, both of which are found in India. They are thus distinguished:—

Claws perfectly retractile; inner cusp of upper sectorial well developed .... FELIS.

Claws imperfectly retractile; inner cusp of upper sectorial rudimentary .... CYNÆLURUS.

A monograph of the family, with excellent coloured figures of all the species by Wolf, has been published by Mr. D. G. Elliot.

Several forms of fossil *Felidæ* have been discovered belonging to both living and extinct genera. In the Siwaliks of North-western India remains of five species of *Felis*, one of which, *F. cristata*, nearly equalled the tiger in size, have been found, together with those of two forms of the great sabre-toothed feline *Machærodus*, an extinct type with enormous canines, and jaw-fragments indicating two other genera, *Ælurogale* and *Æluropsis*, the latter

peculiar to the Indian Pliocene. Some bones of felines have also been found in Indian Pleistocene deposits, but they have not been identified with certainty.

Genus FELIS, Linnæus, 1766.

This genus is perhaps represented by more species in India and its dependencies than in any other tract of the earth's surface equal in area.

Fig. 16.—Skull of *Felis viverrina*. (Gray, P. Z. S. 1867, p. 268.)

Synopsis of Indian, Ceylonese, and Burmese Species.

A. Ears of moderate length, not tufted, or with short hairs only at the end.
- *a.* Large, tawny throughout; tail tufted at the end .... *F. leo*, p. 56.
- *b.* Large, transversely striped; tail not tufted. *F. tigris*, p. 58.
- *c.* Spotted throughout, spots on body less than 2 inches in diameter.
  - *a'.* Large, exceeding 5 feet from nose to tail-tip .... *F. pardus*, p. 67.
  - *b'.* Less than 5 feet from nose to tail-tip.
    - *a''.* Tail about one fourth of total length (from nose to tail-tip)............ *F. viverrina*, p. 76.
    - *b''.* Tail about one third of total length.
      - *a.* No distinct longitudinal bands on crown; ears pointed .... *F. ornata*, p. 84.
      - *β.* Distinct longitudinal bands on crown; ears rounded.
        - *a'.* Upper molar series 3 on each side; tail unspotted.......... *F. rubiginosa*, p. 81.
        - *β'.* Upper molar series 4; tail spotted above .... *F. bengalensis*, p. 78.
- *d.* Large spots, exceeding 2 inches in diameter, or irregular blotches on the body.
  - *a'.* Large, pale grey or whitish with dark rings on body .... *F. uncia*, p. 71.

b'. Brownish grey or tawny, with large irregular blotches or irregular black bands.
a''. Total length from nose to tail-tip over 5 feet in adults .... *F. nebulosa*, p. 72.
b''. Total length under 5 feet .... *F. marmorata*, p. 74.
c. Uniformly coloured or with more or less indistinct transverse bands; size moderate or small.
a'. Chestnut (rarely dark brown) above; tail whitish below .... *F. temmincki*, p. 75.
b'. Silvery grey or buff; fur long, thick, and soft .... *F. manul*, p. 83.
c'. Tawny or grey.
a''. Tail less than one third of total length .... *F. chaus*, p. 86.
b''. Tail about one third of total length; transverse bands much more distinct *F. torquata*, p. 85.
B. Ears long, pointed, with a pencil of hair exceeding half an inch in length at the end.
a. Tail about one fourth of total length .... *F. caracal*, p. 88.
b. Tail less than one fifth of total length.... *F. lynx*, p. 89.

28. Felis leo. *The Lion.*

Felis leo, *L. Syst. Nat.* i, p. 60 (1766); *Blyth, Cat.* p. 53; *id. P. Z. S.* 1863, p. 182; *Jerdon, Mam.* p. 91; *D. G. Elliot, Mon. Felidæ*, pl. i.

Sher, *Babar-sher*, *Singh*, Hindi; *Untia-bágh* (Camel-tiger), Guzerati; *Sáwach*, Kattywar; *Shingal*, Bengali; *Süh* or *Suh* ♂, *Siming* ♀, Kashmiri; *Rastar*, Brahui.

Pupil round. A heavy mane of long hair (varying in length however) all round the neck and on the sides and crown of the head in adult males only. Tail about half the length of the head and body, well tufted at the end, a small horny point at the tip, surrounded by the tuft. Caudal vertebræ 24 or 25.

The skull of a lion is thick, heavy, and massive, with a broad zygomatic arch and well-marked sagittal and occipital crests. The superior surface is remarkable for its flatness; the postorbital processes, too, are very nearly in the same plane as the forehead. The posterior termination of the maxillary bones on the face between the orbits is opposite the end of the nasals. The exposed portion of the presphenoid bone in the mesopterygoid fossa is very narrow, and usually flat. The lower edge of the mandible is convex, owing to a small projection below the hindmost lowest molar. In all these characters the skull of a tiger differs.

Colour. Tawny (pale yellowish brown) everywhere, except the black tail-tuft and the outside of the ears, which are black towards the base, but not at the tip; the hairs of the mane in the prime of life are also more or less black-tipped. Young cubs are marked with darker spots or irregular bands, and faint spots may often be seen on the belly and sides of almost adult or even adult animals, especially females.

Dimensions. Head and body $5\frac{1}{2}$ to $6\frac{1}{2}$ feet long, tail $2\frac{1}{2}$ to 3. A male measured: head and body 5 feet 11 inches, tail 2 feet 11 inches; a female 5 feet 5 inches and 2 feet 7 inches. A lion measuring 8 feet $9\frac{1}{2}$ inches was 3 feet 6 inches high. The female is considerably smaller than the male, and, as with tigers, some individuals probably are larger, others smaller than the above extremes. The hairs of the mane are 10 inches to a foot long in some Indian lions. A skull of an adult male lion measures in extreme length 13 inches, breadth across zygomatic arches 9·4.

Distribution. In India the lion is verging on extinction. There are probably a very few still living in the wild tract known as the Gir in Kattywar, and a few more in the wildest parts of Rájputána, especially Southern Jodhpur, in Oodeypur, and around Mount Abú. About 20 years ago lions were common near Mount Abú, several were shot near Gwalior, Goona, and Kota, and a few still existed near Lalitpur, between Saugor and Jhansi. One is said to have been killed near Goona in 1873. In 1864 one was killed near Sheorajpur, 25 miles west of Allahabad; and when the railway was being made from Allahabad to Jubbulpoor, in 1866, a fine lion, with a good mane, was shot by two of the engineers near the 80th milestone from Allahabad. About 1830 lions were common near Ahmedabad. Several years previously, in the early part of the century, lions were found in Hurriana to the northward, and in Khandesh to the south, in many places in Rájputána (one was shot in 1810 within 40 miles of Kot Deji, in Sind), and eastward as far as Rewah and Palamow. It is probable that this animal was formerly generally distributed in North-western and Central India*. I have never heard of lions in Cutch, and suspect Jerdon was mistaken in supposing them to be found there.

Eastward and north of India the lion is not found, and almost the only part of Western Asia in which it is common is in Mesopotamia and part of South-western Persia. As is well known, this animal abounds throughout Africa.

Varieties. For a long time it was supposed that the Indian lion was maneless, and in numerous books on natural history there are accounts of the "Maneless lion of Guzerat" (*F. leo guzrattensis*, Smee, Trans. Z. S. i, p. 165, pl. xxiv; P. Z. S. 1833, p. 140). It is probable that maneless male individuals may occasionally occur, and it is well known that lions in some parts of Africa, *e.g.* the Cape and Algeria, have longer manes than in other tracts. It is also asserted that lions inhabiting forests have shorter manes, owing to the hairs being pulled out by thorny bushes, but this is doubtful. It is certain, however, that some adult Indian lions have well-developed manes, and the typical maneless Guzerat lion in the British Museum is immature. The lion figured by Captain Smee was shot near Ahmedabad, and was a short-maned lion, similar to most Persian or Abyssinian animals.

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* J. A. S. B. xxxvi, pt. 2, p. 189; P. A. S. B. 1868, p. 198; Journ. Geog. Soc. 1870, p. 204.

Habits. The habits of tigers and lions are for the most part similar, except that the tiger inhabits more wooded countries. Both animals are mainly nocturnal in their movements, sleeping in the daytime and wandering greatly in search of food at night. Both are excessively powerful, and able to kill large animals, such as full-grown cattle, horses, or even camels for food, and both occasionally kill men, and are greatly feared by the inhabitants of the country. Round animals of so ferocious a nature a series of myths have naturally collected, and it is difficult to unravel the true from the false in such traditions. It is not surprising that even intelligent sportsmen, finding that particular classes of natives have a singularly accurate knowledge of the haunts and habits of wild animals, should not always be able clearly to distinguish which of these habits have actually been observed, and which are merely traditional, both being equally believed in by the narrators.

Lions are perhaps bolder than tigers, and certainly much more noisy, their habit of roaring, especially in the evening and at night, having necessarily attracted the attention of all who have been in countries infested by them. Of the two the tiger, though standing lower, is heavier in the body, and I think the more powerful animal.

In India lions feed chiefly on deer, antelopes, wild pigs, cattle, horses, donkeys, and camels, and used formerly to kill many of the latter. Whether lions usually kill their prey, as tigers do, by breaking the neck, I cannot say; in the only cow I ever saw that had been killed by a lion (in Northern Abyssinia) the vertebræ were not dislocated. I also saw a lioness hold a camel by the throat for some minutes, without attempting to break its neck.

Lions are more easily tamed than most of the felines. They often breed in confinement*. The period of gestation is about 108 days, and from three to six young (in India it is said two to three) are commonly born in one litter. The eyes are open at birth. Young lions want the mane, which becomes gradually developed after the full growth is attained.

29. **Felis tigris.** *The Tiger.*

Felis tigris, *L. Syst. Nat.* i, p. 61 (1766); *Blyth, Cat.* p. 54; *Jerdon, Mam.* p. 92; *D. G. Elliot, Mon. Fel.* pl. iii.

Bágh, Sher (female *Bághni, Sherni*), H.; *Náhar, Sela-vágh*, H. of Central India; *Babr*, P.; *Mazar*, Baluchi; *Shinh*, Sindhi; *Padar-suh*, Kashmiri; *Patayat-bágh, Wahág*, Mahr.; *Go-vágh*, Beng.; *Tut, Sad*, Hill tribes of Rájmehál; *Garúmkúla*, Kol.; *Lákhra*, Uraon; *Krodi*, Kondh; *Kula*, Sonthal, Ho and Korku; *Púli*, Tam., Tel., Mal., and Gond; *Púli-redda-púli*, *Peram-pilli*, Tam.; *Pedda-púli*, Tel.; *Perain-púli, Kúdua*, Mal.; *Kuli*, Can.; *Nári*, Kurg; *Pirri, Bürsh*, Toda; *Tág*, Tibetan; *Túkt* or *Tük*, Bhot.; *Sathong*, Lepcha; *Keh-va*, Limbú; *Schi*, Aka; *Matsá*, Garo; *Kla*, Khasi; *Sa, Ragdi, Tekhu, Khudi*, Naga; *Humpi*, Kúki; *Sumyo*, Abor.; *Sü*, Khamti; *Sirong*, Singpho; *Kei*, Manipuri; *Misi*, Kachari; *Kya*, Burmese; *Kla*, Talain; *Khi, Botha-o, Tupuli*, Karen; *Htso*, Shan; *Rimau, Harimau*, Malay.

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* For an excellent account of the lions bred in the Dublin Zoological Gardens, see V. Ball, Trans. Roy. Irish Academy, xxviii, p. 723.

Pupil round*. Hair of the cheeks from behind the ears round the sides of the neck considerably lengthened in adult males, so as to form a ruff. Hair of body short and close (but varying in length somewhat with the season). Tail about half the length of the head and body, tapering gradually, not tufted at the end. Tail vertebræ 22 to 26.

The skull is very massive and heavy, the zygomatic arches excessively wide and strong, and the crests for attachment of the muscles highly developed. On an average the skull is even larger, wider, and more massive than that of the lion. The facial surface is considerably more convex, the maxillary bones terminate posteriorly between the orbits in front of the nasals, and the lower surface of the presphenoid in the roof of the posterior nares is much broader than in the lion, and is generally raised into a ridge along the middle. The lower surface of the mandible is nearly straight to near the angle, then slightly concave. Consequently the skull of a tiger, with the lower jaw attached, rests firmly on a flat surface, whilst the posterior portion of the skull nowhere touches the surface. This is not the case with any other great feline, except perhaps the jaguar.

Colour. Ground-colour, above and on the sides, varying from pale rufous to brownish yellow, below white, striped transversely with black throughout the head and body. The tail is marked with black rings. Ears black outside, with a large white spot on each. The ground-colour is much more rufous in some animals than in others, and forest tigers are probably darker and redder than those inhabiting the thin jungles of Central and Southern India. Young animals, too, are more brightly coloured than old. The young are born striped. Both black and albino tigers have been met with, though both are very rare. Mr. C. T. Buckland tells me that he once saw a black tiger that had been shot near Chittagong; whilst an albino tiger was exhibited in London, at Exeter Change, early in the century, and figured by Griffith†.

Dimensions. Adult males measure $5\frac{1}{2}$ to $6\frac{1}{2}$ feet from nose to insertion of tail, the tail being about 3 feet long. In a male 9 feet 4 inches long, measured by Tickell, the head was 16 inches, neck 12, body 4 feet, tail 3 feet 2 inches. Females measure about 5 to $5\frac{1}{2}$ feet from nose to rump. The height at the shoulder is about 3 feet to 3 feet 6 inches. The usual measurement of tigers by sportsmen is from the nose over the curves of the head and back and along the tail to the tip. Thus measured full-grown tigers are generally 9 to 10 feet long, tigresses 8 to 9; but tigers have been killed 12 feet in length, and I myself shot an apparently full-grown tigress only 7 feet 6 inches long, and another specimen that had cubs with her measured only 7 feet 8 inches‡. The skull

* Jerdon is in error in stating that the pupil is vertical.

† Griffith's 'Cuvier,' ii, p. 444.

‡ A very good account of the measurements of tigers is given in Sterndale's 'Mammalia of India,' pp. 162, 527. See also Sir J. Fayrer, 'Nature,' June 27th, 1878, xviii, p. 219. By both tigers measuring over 12 feet are recorded. Tickell, in his MS. notes, states that he once saw a tiger that measured 11 feet 9 inches.

of a male tiger 9 feet 7 inches long measured 13 inches in extreme length, 12 in basal length, and 9 in breadth across the zygomatic arches; that of a large Nepal tigress 10 inches in extreme length by 7·8 in zygomatic breadth. But an enormous skull from Purneah measures according to Sterndale 15·25 by 10·5. Sanderson found a bulky, well-fed male tiger to weigh 25 stone (350 lbs.), and Elliot gives the weight of two large male tigers as 360 and 380 lbs., and of a large tigress 240 lbs. Forsyth gives much higher weights, but it is not clear whether he actually weighed the animals.

Distribution. Throughout India, Burma, and other parts of South-eastern Asia, Java, and Sumatra, but not Ceylon, nor, it is said, Borneo. The tiger occurs in suitable localities throughout a great part of Central Asia, and is found in the Valley of the Amur, the Altai Mountains, around Lob Nor in Eastern Turkestan, about the Sea of Aral, on the Murgháb near Herat, on the southern coast of the Caspian (Hyrcania), and in the Caucasus, but not in Tibet, Afghanistan, Baluchistan, or Persia south of the Elburz Mountains on the Caspian.

In India tigers still occur wherever large tracts of forest or grass-jungle exist; but within the last 20 or 30 years the number of these destructive animals has been greatly reduced, and they have now become scarce, or have even in some cases disappeared entirely in parts of the country where they formerly were common. This has been the case especially throughout a large area of the Central Provinces, in many parts of Bengal, and several districts of the Bombay Presidency. In the forests at the base of the Himalayas tigers are common, and they ascend the hills occasionally to an elevation of 6000 or 7000 feet, but none are found in the interior of the mountains. The species is entirely wanting throughout Baluchistan, Afghanistan, and the other countries due west of India, and is only found in a few places in Upper Sind and the western Punjab. It is wanting in Lower Sind and Cutch. To the eastward, in Assam and Burma, tigers are generally distributed.

The absence of tigers in Ceylon would seem to indicate that this animal has only recently migrated into Southern India, more recently than most of the other mammals, the majority of which are found on both sides of Palk Straits.

Habits. For a full account of the habits of tigers, on which more has been written than probably on any other wild animal, reference may be made to numerous works by Indian sportsmen. Foremost amongst these are Sir J. Fayrer's 'The Royal Tiger of Bengal,' Sterndale's 'Seonee' and 'Natural History of Indian Mammalia,' Forsyth's admirable 'Highlands of Central India,' Sanderson's equally accurate 'Thirteen Years among the Wild Beasts of India,' and McMaster's 'Notes on Jerdon's Mammals of India.' The first gives an account of the tiger in the grass-jungles and swamps of the Ganges valley, the second and third describe the animal haunting the forests of the Central Provinces, the fourth writer's experience was mainly gained in Mysore, and that of the fifth in the hills of Southern India.

Tigers are monogamous. The period of gestation is about 14 to 15 weeks, and from 2 to 5 young, and occasionally it is said even 6, are produced at one time. I have on more than one occasion known four cubs to be cut out from a tigress's body after death. There is no particular season for breeding. Young cubs are found at all times of the year. The tigress is said to avoid the male when about to bring forth, and to hide her young from him; but tigers are occasionally, though not often, seen accompanying tigresses and cubs. The young remain with the mother until nearly or quite full-grown; and when more than two tigers are found consorting together, the party consists in general of a tigress and her full-grown offspring, the old tiger occasionally associating with his family also. Forsyth observes that a tigress cannot have young more frequently than once in three years, because the cubs take about that time to attain their full growth.

These animals are usually found solitary or in pairs, less frequently in parties of from three to six. They remain at rest during the day, and roam about at night in search of food. Their wanderings are considerable, and frequently extend to many miles in the course of the night, a preference being given to well-beaten tracks or sandy beds of streams. On these, in the early morning, every incident of the night's adventures may be traced by an experienced tracker. The tiger sometimes continues his stroll in the early morning, and his movements, as Forsyth remarks, "may often be traced up to eight or nine o'clock by the voices of monkeys and peafowl, the chatter of crows and small birds, and the bark of sámbar and spotted deer." The alarm-cries of all these animals are quite peculiar and different from their ordinary calls; but it must be remembered that the cause of their alarm may be a leopard, a wild cat, a bear, a dog, or even in some cases a man, and not necessarily a tiger.

The tiger usually takes up his abode for the day in deep shade, especially in the hot season, and in general near water under a dense bush or tree, in high green grass, or in thick low cover such as green rushes, tamarisk, or some of the other plants that grow in the beds of streams. Not unfrequently a high bank affords him the cool shade he loves, and in rocky parts of the country caves are frequently resorted to; where ruins exist in jungle they are often a favourite abode. A well-known habit of all wild animals, but especially remarked in the case of the tiger, is the regularity with which particular haunts are selected in preference to others that appear equally well suited. Some one patch of high nul grass near the river-bank or on the edge of the swamp, one dense thicket of *jhow* (*Tamarix*) or *jáman* (*Eugenia*) amongst a dozen apparently similar in a stream-bed, one especial pile of rocks amongst hundreds along the hill-side, will be the resort year after year of a tiger, and when the occupant is shot, another, after a brief interval, takes his place.

Tigers, especially in the cold and wet seasons, when there is abundance of cover and water, are great wanderers, roaming from

place to place, though probably keeping in general within an area of 15 or 20 miles in diameter. In the hot season from March to June their range is usually more restricted, as vegetation is dried up or burnt except near the few spots where water is still found.

As has already been remarked, tigers are very much less in the habit of roaring than lions are. Where the latter are common scarcely an evening passes without their being repeatedly heard. I have often been in places where tigers were equally abundant, but it is an exception for their roaring to attract attention*. Their usual call is very similar to that of the lion, a prolonged moaning, thrilling sound, repeated twice or thrice, becoming louder and quicker, and ending with three or four repetitions of the last portion of it. Besides this, there is a peculiar loud "woof" produced when the animal is disturbed or surprised, a growl that it utters when provoked, and the well-known guttural sound of rage repeated two or three times when it charges. When hit by a bullet a tiger generally roars, but tigresses, at all events, very often do not; I have on three occasions at least known a tigress receive a mortal wound and pass on without making a sound.

Tigers swim well and take readily to water, even crossing arms of the sea. They but rarely ascend trees, and appear quite incapable of climbing a vertical stem, large or small. It is true that they have been known to take men out of trees, from heights it is said of even 18 or 20 feet; but such cases are always due to some peculiarity in the tree, a sloping trunk, or a fork 8 or 10 feet from the ground, from which the animal can get a fresh start. As a rule a tiger, like other mammals, pays no attention to men in a tree even a very few feet from the ground, if they do not move or speak.

In fact tigers are much less addicted to springing than is popularly supposed, and rarely move their hind legs off the ground except to clear an obstacle. Still they are capable of springing some distance. They have a habit, like cats, of scratching wood, and often show a predilection for the trunk of a particular tree, on which the marks of their claws may be seen up to a height of 10 or, it is said, 12 feet.

The ordinary game-eating tiger of the forest lives mainly on deer and pigs, and avoids the neighbourhood of human habitations. Almost all tigers, however, occasionally kill cattle. The wild animals commonly eaten by tigers are pigs, deer of all kinds, nylgai, four-horned antelope, and porcupines. The last are evidently a common prey. I have repeatedly, in the Central Provinces, when skinning tigers, found fragments of porcupine-quill encysted beneath the skin. Peafowl may be slain at times, but more often, I think, by leopards than by tigers, and the same may be said of monkeys. Bears, though not often attacked, occasionally fall

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* It is true that my own experience was at not quite the same time of the year. I have been repeatedly in jungles inhabited by tigers from November till June, and only in lion-haunted tracts in July and August. But all travellers notice the noisiness of lions.

victims. I have more than once seen unmistakable remains of a bear that had been devoured; and Sanderson relates an instance of a tiger that was said to have taken habitually to the slaughter of bears for food. Young gaur are occasionally killed, but the full-grown animal is more than a match for most tigers. Instances are said to have been known of even young elephants being attacked, one such is mentioned by McMaster. In fact a hungry tiger will probably kill any other animal he can for food. He is said to have been observed catching and eating frogs; and Mr. Simson found tigers in Eastern Bengal, during inundations, feeding upon fish, tortoises, crocodiles, and large lizards, and he once killed a tiger the pouch of which was crammed with grasshoppers or locusts. It is not to be supposed that the tiger's prey is killed without a struggle, and the more powerful animals sometimes beat off their assailants, whilst instances have been recorded in which large boars have killed tigers that attacked them, the two having in some cases been found dead together.

Great numbers of domestic animals are killed by tigers annually, and many of the latter appear to live entirely upon cattle. Oxen are the ordinary prey of the cattle-eating tiger, who is often an older animal than the game-killer, having become by long experience more cunning and less afraid of man. Tigresses with cubs also often quarter themselves upon a village and subsist in luxury on the flocks and herds of the villagers. Sheep and goats are not so often attacked, tigers having a distinct preference for beef, but ponies, and even horses and camels, are occasionally killed. Buffaloes in a herd are fully able to defend themselves, and generally attack a tiger, many incidents being recorded in which they have rescued their herdsman; but tigers often kill young buffaloes if they are found away from the herd.

There has been much discussion as to the manner in which the tiger kills its prey. The popular notion was, and probably still is, that the tiger springs upon its victim from a distance, and either kills the animal by one blow of its paw, or tears the throat with its teeth and sucks the blood. All this is certainly incorrect, so far, at all events, as cattle are concerned; small animals may perhaps be killed by a blow of the paw. I have seen many oxen that had been killed by tigers, and in numerous cases (always, I think, when I ascertained the point) the neck had been broken, whilst in several instances, despite the marks of fangs upon the throat, the great blood-vessels of the neck were untouched, and claw-marks were confined to scratches on the forequarters. All these details agree with the description given by Sanderson from the accounts received from herdsmen. According to these, the tiger does not spring upon his prey: "clutching the bullock's forequarters with his paws, one being generally over the shoulder, he seizes the throat in his jaws from underneath and turns it upwards and over, sometimes springing to the far side in doing so, to throw the bullock over and give the wrench which dislocates its neck. This is frequently done so quickly that the tiger, if timid, is in retreat again before the herdsman

can turn round." It is probable that with smaller animals the tiger does not always take the trouble to break the neck, and in the case of large beasts such as buffaloes and gaur, which he is unable to overthrow, he occasionally hamstrings them, I think by a blow with his claws, but am not sure. I have twice known instances in which buffaloes were left hamstrung by tigers. Tigers sometimes undoubtedly kill or disable by the fearful blows they can give with their paws, but the above is, I believe, their usual plan of killing oxen.

Sterndale confirms Sanderson's account, and also points out that a tiger very rarely springs upon his prey; he probably takes advantage of the momemtary paralysis produced by his appearance to make a short rush and to seize the animal he intends to devour. He generally stalks as near as he can, but he has been seen to gallop after animals for some distance before seizing one of them.

I quite agree with Sanderson, who regards "the venerable belief in tigers sucking the blood of their victims" as one of the numerous myths that have collected around beasts of prey in the course of ages.

If an animal is struck down in the daytime, the body may be dragged some distance, but is usually left untouched till evening. At or soon after nightfall, or occasionally in quiet places before sundown, the tiger returns to the kill (known as *ghara* or *mara*), and, if the spot is open or otherwise unsuited for his repast, drags the body to a more convenient place. The enormous muscular power of the tiger is shown by the way in which he can transport large carcases of oxen or buffaloes over rough ground, up and down steep banks and through thick bushes. He sometimes lifts the body completely off the ground; Sanderson mentions an instance in which a bullock, weighing about 400 lbs., was thus carried for 300 yards. He almost always commences by eating the intestines and hindquarters. As a rule he remains near the kill, sometimes rushing out upon any intruder and driving away jackals, vultures, and other carrion-feeders; but more often he hides the carcase under bushes or leaves, and retires to a neighbouring thicket beside water. If very hungry, a tiger will devour both hindquarters the first night. If undisturbed, he generally remains about three days near the carcase, feeding at intervals. In one case, so far as I could learn, a large ox was completely devoured in 48 hours, only a few fragments of bones and the contents of the stomach being left. Forsyth says that a tiger which lives entirely on cattle kills an ox about once in five days, and passes about two days after finishing his last victim without looking about for food, though he will strike down another quarry if it comes near him. Young tigers are more destructive than older animals, and when one gets amongst a herd of cattle, he frequently kills several, apparently in pure wantonness. A tigress with cubs, too, is frequently very destructive, partly, it is said, in order to teach the young tigers to kill their own prey. An animal that has been fired at, especially if he has been wounded, when returning to the kill, will frequently never again return to the body of his prey, but kill afresh when hungry.

It is well known that, although tigers as a rule kill their own food, they do not disdain carrion; in numerous instances they have been known to eat animals killed by sportsmen and even bullocks that had died of disease. Cases are even on record in which a tiger that had been shot has been devoured by another of his own species.

The ordinary game- or cattle-eating tiger is the greatest of cowards in the presence of man, and often allows himself to be pelted off from the animal he has seized. Sterndale mentions a case in which a herdsman laid his heavy iron-bound staff with impunity across the back of a tiger who had seized one of his cows; and I once found two young children, the eldest not more than 8 or 9 years old, left in jungle to drive a tiger away from the body of a bullock he had killed, and to prevent his eating it or dragging it away. The half-wild inhabitants of the Indian forests have but little fear of ordinary tigers; and after some 20 years' wanderings in large part through tracts infested with tigers, I agree with Forsyth that, except in the haunts of a man-eater, there is little danger in traversing any part of the jungles. Bears are, I think, more to be feared than tigers. The only tigers not being man-eaters that are dangerous are tigresses with young cubs, and occasionally a hungry tiger who has just killed his prey. Of course this only refers to unwounded tigers; a tiger that has been wounded will usually attack any one who approaches him, but even he will not charge home against a body of men, and one successful method of shooting tigers and following them when wounded is founded on this circumstance.

The man-eater is, to quote Forsyth, "a tiger who has got very fat and heavy, or very old, or who has been disabled by a wound, or a tigress who has had to bring up young cubs where other game is scarce. All these take naturally to man, who is the easiest animal of all to kill, as soon as failure with other prey brings on the pangs of hunger." A tiger that has once taken to man-eating will probably, having got over his innate fear of the human species, continue to live upon the same prey, though it is the exception for even man-eaters to confine themselves to human food. Still a few do so to a great extent, and a fearful scourge such a tiger becomes. The destruction of human life by tigers is still considerable in India, and the whole takes place in comparatively thinly peopled portions of the country. Thus in Lower Bengal alone in six years 1860–66, 4218 persons were killed by these animals. In all probability nearly the whole destruction was caused by a very small percentage of the tigers inhabiting the country.

Forsyth says that great grazing districts, into which cattle come for a limited season only, are always the worst for producing man-eating tigers. There is much reason for believing that a tigress, who has taken to preying upon man, brings up her cubs to the same mode of life. A man-eater generally becomes cunning and suspicious beyond all ordinary tigers, and around this, the most terrible of all wild animals, myths and legends centre until it is difficult to know what is true and what is false. Many of the

wolf-legends of Europe may be found repeated and intensified in connection with the Indian tiger. Foremost among these tales is of course the wehr-wolf snperstition—a belief that certain men have the magical power to transmute themselves at will into wild beasts. But the most remarkable of all is the creed, universal in the Central Provinces and generally prevalent, I believe, throughout India, that the spirits of those men who have been killed by a tiger attend him and sit upon his head, and that they not only warn him against danger, but, entertaining malice against their fellow-men, aid him to destroy them. This superstition exists amongst many races.

Tigers or representations of tigers are actual objects of adoration, or, to speak more correctly, propitiation, amongst some of the wilder tribes of the Indian Peninsula; and one form of oath in Courts of Justice is, or was formerly, administered on a tiger's skin. Various parts of the animal, such as the front teeth, the claws, the whiskers, and the rudimentary clavicles (*birnukh*), are preserved as amulets and charms. The whiskers, Jerdon says, in some parts of Southern India are considered to endow the fortunate possessor with unlimited power over the opposite sex. In other parts they are regarded as a deadly poison, and are destroyed as soon as a tiger is killed.

To one peculiar and wide-spread myth, the relations between tigers or lions and jackals, some reference will be found under the head of the latter.

The destruction of so dangerous an animal as the tiger is naturally one of the principal objects both of the native shikári, who kills for the reward given by Government, and varying from Rs. 5 to Rs. 50 in different districts, and of the European sportsman. The common native plan, adopted occasionally by Europeans, is to build a platform, or *machán*, in a tree, either close to the carcase of an animal that has been killed by a tiger, or to a spot where a live animal, usually a bullock or young buffalo, is tied up as a bait, and to shoot the tiger when he comes to feed on the carcase or to seize the bullock. Another system, adopted by Europeans from Indian chiefs, is to drive the jungles with a line of elephants, the sportsmen shooting from howdahs. This is often almost the only practicable plan in the great plains of Bengal and Upper India, which are covered with grass from 8 to 20 feet high.

In the smaller jungle-patches of Central and Southern India, tiger-shooting is chiefly attempted in the hot season, and the tiger is either driven by beaters past a tree on which the sportsman sits, or followed up, either on an elephant or on foot. Baits, usually young buffaloes, are tied out in selected spots, in order to induce the tiger to kill, and remain during the heat of the day in places convenient for finding him; and native trackers, many of whom could probably vie with the far-famed American Indians themselves, are employed to follow up the animal and ascertain where it is lying. A full account of this method is given by Forsyth in the 'Highlands of Central India.' Occasionally, especially when a

tiger has been wounded, a herd of buffaloes are employed to drive him out of the cover, which they do very effectually, charging him in a body if he does not retreat.

In some parts of Southern India a plan is adopted of enclosing a small area of jungle, into which a tiger has been traced, by nets. The animal is then speared or shot when occasion offers. A full account of this method is given by Sanderson in the work already quoted. According to Jerdon, in the Wynaad tigers are driven into a net and speared by a particular class of natives.

It would be impossible to notice all the methods adopted for destroying tigers. In some parts of the country traps are used, but the cage-trap, though often successful in capturing panthers, is seldom so with tigers. Tigers are occasionally taken in pitfalls. A kind of figure-of-4 trap with a heavy platform loaded with stones, that falls upon the tiger and crushes him, is used in parts of Orissa and, I believe, elsewhere. In Burma a bow is set with a poisoned dart, and let off by a string across the path. Spring-guns have also been used. Poisoning the carcase of an animal killed by a tiger is also resorted to in some cases, strychnine being chiefly used for the purpose by Europeans, but it is not always effective.

The age to which tigers live is not clearly ascertained. Sanderson mentions an instance in which he killed a large cattle-eating tiger that had been known to haunt a particular group of villages for twenty years. This animal showed no signs of age except that his coat was becoming light-coloured.

Tigers captured young are easily tamed, and many of the adult animals in menageries are perfectly good-tempered, and fond of being noticed and caressed by those whom they know. They have repeatedly bred in confinement, though not so freely as lions, and the cubs more rarely survive.

30. **Felis pardus.** *The Leopard or Panther.*

Felis pardus, *L. Syst. Nat.* i, p. 61 (1766); *Blyth, Cat.* p. 55; *Jerdon, Mam.* p. 97; *Elliot, Mon. Fel.* pls. vi, vii.
Felis leopardus, *Schreb. Säugeth.* iii, p. 387, pl. ci; *Kelaart, Prod.* p. 45.

Tendwa, Chita, Sona-chita, Chita-bágh, Adnára, H.; *Palang,* Pers.; *Diho,* Baluch.; *Súh,* Kashmiri; *Tidua, Srighas,* Bundelkand; *Gorbacha* or *Borbacha,* Deccan; *Karda, Asnea, Singhal, Bibia-bágh,* Mahr.; *Tenduwa, Bibla,* Bauris of Deccan; *Honiga, Kerkal,* Canarese; *Teon-Kula,* Kol.; *Jerkos,* Paharia of Rájmehál; *Burkál, Gordág,* Gond.; *Sonora,* Korku; *Chiru-thai,* Tam.; *Chinna-puli,* Tel.; *Puli,* Mal.; *Kutiya,* Cingalese; *Bai-hira, Tahir-hé, Goral-hé,* or *Ghor-hé,* hill-tribes near Simla (according to Jerdon, generally known as *Lakhar-bagha,* a name elsewhere used for the hyæna); *Sik,* Tibetan; *Syik* or *Syiak,* or *Sejjiak,* Lepcha; *Kajengla,* Manipuri; *Misi patrai, Kam-kei,* Kuki; *Hurrea kon, Morrh, Rusa, Tekhu Khuia, Kekhi,* Naga; *Kya-lak* or *Kya-thit,* Burmese; *Klapreung,* Talain; *Kiché-phong,* Karen; *Rimau-bintang,* Malay.

Pupil circular. Tail varying from rather more than half to about three quarters the length of the head and body. Caudal vertebræ usually 24 or 25, but varying, it is said, from 22 to 28.

The upper surface of the skull is arched, as in the tiger, but the lower jaw is convex beneath, as in the lion, the condyle being proportionally nearer the angle even than in the latter. When a leopard's skull, with the mandible attached, is placed on a flat surface, the hinder part of the skull almost always touches that surface.

Ground-colour above from rufous to yellowish white or pale brownish yellow, sometimes darker, sometimes paler; below white. The whole animal is spotted. The spots or rosettes on the back, sides, and dorsal portion of the tail are black externally, pale-coloured within; they vary much in number, size, and form; the surrounding black border of each spot is more or less interrupted, an unbroken ring being of rare occurrence, whilst the inner pale area is sometimes darker than the ground-colour outside, but usually the same. The spots on the head, distal portions of the limbs, and lower parts have no pale centres. Young leopards are of a brownish colour, and the spots are much less clearly defined.

Dimensions very variable, the total length of head, body, and tail together ranging from 5 to 8 feet. A large male measured:—Head and body 4 feet 9 inches, tail 3 feet 2 inches; total 7 feet 11 inches (*Jerdon*). A smaller animal 3 feet 10 inches and 2 feet 10 inches; total 6 feet 8 inches (*Tickell*). Height at shoulder about 2 feet. An average-sized skull measures 6·9 inches in basal length and 5 inches wide across the zygomata; but in the series of adult skulls in the British Museum the basal length varies from 5·6 inches to 8·1.

Distribution. Asia generally, with the exception of Siberia and the high Tibetan plateau. Found also throughout Africa. In India, Burma, and Ceylon this animal is generally distributed, except in parts of Sind and the Punjab. Fossil remains have been found in Great Britain, Spain, France, and Germany.

Varieties. By very many writers, and amongst Indian naturalists by Sykes, Elliot, Horsfield, Hodgson, and Sterndale, it has been thought that there are two species of Indian leopards—a larger and a smaller. Even Jerdon appears to have been in doubt on the subject. Most of the sportsmen who have hunted in Central India and many native shikáris distinguish these two forms, and in parts of the country there is some appearance of two races—a larger form that inhabits the hills and forests, and a smaller form, commonly occurring in patches of grass and bushes amongst cultivated fields and gardens. The larger form is said to have a shorter tail, a longer head with an occipital crest, and clearly defined spots on a paler ground-colour. The smaller form has a comparatively longer tail, a rounder head, less clearly defined spots, and rougher fur. I cannot help suspecting that the difference is very often due to age *, as in the case of the supposed two species of four-horned antelope, for younger leopards have rounder heads, without

* Tickell, I find, in his MS. notes makes the same suggestion.

any occipital ridge to the skull, and rougher fur than older animals. I have for years endeavoured to distinguish the two forms, but without success. The size of the animal, the number, form, and closeness of the spots, and length of tail are all extremely variable characters. The animals found in the damp forests of the Himalayas, Bengal, Assam, and Burma are darker and redder in colour, and have the spots larger in proportion to the interspaces, than the paler-coloured leopards of the Indian Peninsula; and I think some of the leopards of Central India are larger than is usual elsewhere. I cannot myself, as I have said, in many cases determine to which of the two supposed forms an Indian leopard-skin should be referred, yet I can tell most African skins * at a glance, as the spots are very much smaller; and there is a race inhabiting Persia, and found in Baluchistan and the mountains of Sind †, that differs widely from all the others and is quite intermediate in coloration and spotting between the leopard and the ounce, the resemblance to the latter being increased by the long fur and thick hairy tail. These two varieties, the African and the Persian, however, pass by insensible gradations into the ordinary form; and I cannot find any difference in the skulls or evidence to satisfy me that there is any constant distinction between different races of leopards, pards, or panthers. This is the conclusion at which Mr. Blyth also arrived.

A black variety of the leopard is not uncommon. The spots on this can still be traced if the skin is viewed in certain lights, but the general colour is uniform black, the colour of a black cat. This form, though distinguished by some writers as *Felis melas*, is unquestionably only a variety, the occurrence of black and spotted cubs in the same litter having been repeatedly recorded. Black leopards are more common on the hills of Southern India and in Travancore than in other parts of the peninsula; they are also said to be of frequent occurrence in the Malay Peninsula. A white (albino) leopard is figured in Buchanan Hamilton's drawings.

Habits. The habits of leopards differ materially from those of tigers. The leopard is much more lithe and active even than the tiger, climbing trees readily, and making immense bounds clear off the ground. The leopard is often found in the neighbourhood of villages, hiding during the day amongst the crops or in the bushes about cultivation, and carrying off sheep, goats, and especially dogs, at night. In pursuit of his prey he seems to have but little fear of man; he will enter outhouses, native huts, or even tents. He cares but little for the neighbourhood of water even in the hot weather, his favourite haunts being rocky hills covered with thick scrub, and he is generally found in caves and under piles of rocks.

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* Probably the true *F. leopardus* of Erxleben &c. and *F. pardus* of Temminck.

† Probably *F. tulliana*, Val. See Alston and Danford, P. Z. S. 1880, p. 51. I have a fine skin, for which I am indebted to Mr. H. E. Watson, from the Khirthar range on the western frontier of Sind.

He can conceal himself in the most wonderful way, his spotted hide blending with the ground, and his lithe loose form being compressible into an inconceivably small space. I quite agree with Forsyth, from whom I have taken several of the above traits, that he is more courageous than the tiger; if brought to bay, the leopard will charge again and again with the utmost ferocity.

Large leopards, or panthers as Jerdon calls them, often kill cattle, ponies, donkeys, and large deer such as sámbar, but the smaller varieties have to content themselves with inferior prey. The leopard, however, is absolutely without prejudice in the matter of food—all beasts, birds, and, I believe, reptiles that are not too large to kill or too small to catch are the same to him; he will strike down an ox or bound upon a sparrow. If he has a predilection, it is probably for dogs and jackals. He is a terrible foe to monkeys, and kills many of the hanúmáns or langúrs who inhabit the rocky hills in which he delights. Leopards, like tigers, sometimes kill their prey by breaking the neck; but I am disposed to believe that they frequently either tear open the throat or hold it in their jaws and strangle their victim. However, I have not had many opportunities of seeing animals killed by them. They carry away the body like tigers, and hide what they do not eat, very often in a tree.

Leopards occasionally take to man-eating and, owing to their boldness, become even a more fearful scourge than tigers. In two parts of India, the Sonthál Pergunnahs south of Bhágalpur, and Seoni in the Central Provinces, at about the same time (1857–60), leopards were singularly destructive to human life, taking men, women, and children by night out of houses, or off the macháns or platforms built in the fields to watch the crops from. One leopard near Seoni, commemorated by Sterndale and Forsyth, is said to have killed 200 human beings in two years before he was shot.

The idea that leopards object to cross water, though supported by an observation of Blyth's that a tame animal showed great aversion to wetting his feet, is erroneous. Like other wild animals, they swim well.

The leopard, as a rule, is a very silent animal, rarely, except when provoked, uttering a sound. When surprised and when charging, he makes noises similar to those made by a tiger; but his call is very different. I have occasionally heard a sound which agrees with the description I have received both in Africa and in India of this animal's cry, and which corresponds to the account of it given by Captain Baldwin in the 'Large Game of Bengal.' It consists of a peculiar harsh noise between a grunt and a cough, repeated quickly three or four times. Forsyth calls it a harsh grating roar.

The period of gestation does not appear to have been accurately recorded, but is said to be about the same as in the tiger and lion, or fifteen weeks. The young are born about February or March in the Peninsula of India, and a litter usually consists of two, three, or four cubs. They probably take about the same

time as a tiger, three years, to arrive at full growth. Young leopards are more difficult to tame than tigers or lions; and, even when tamed, are less to be trusted. On the whole, this feline has an exceedingly bad character.

Leopards are killed in large numbers by native shikáris, but, despite the greater prevalence of the species, fewer leopards than tigers are shot by European sportsmen. This is due to the difficulty of finding leopards, owing to the manner in which they conceal themselves and to their independence of water, and also to the extremely difficult aim they afford to a rifle, on account of the swiftness of their movements and their power of hiding themselves. The ordinary Indian plan of shooting them is to tether a kid or calf, or occasionally a dog, near the tree in which the hunter sits, and to make the bait bleat from time to time by pulling a string. A favourite device with native shikáris is to put a fish-hook through the unfortunate bait's ear and attach a string thereto. A light from an earthen pot (garra) is sometimes thrown on the tethered animal, or the ground around is sprinkled with chaff or flour to render the leopard more conspicuous at night.

Owing to his greater boldness, a leopard is much more easily trapped than a tiger, and many are taken alive in a kind of cage baited with a live calf, goat, or dog. The bait is usually placed in a separate partition, so arranged as to open and release the bait by the shutting of the door which entraps the leopard. Fall-traps and spring-bows or guns are also used to kill panthers as well as tigers.

31. **Felis uncia.** *The Ounce or snow Leopard.*

Felis uncia, *Schreber*, *Säugeth.* iii, p. 586, pl. c (1778); *Blyth, Cat.* p. 58; *Jerdon, Mam.* p. 101; *Elliot, Mon. Fel.* pl. iv.
Felis irbis, *Ehrenberg, Ann. Sc. Nat.* xxi, p. 410 (1830).

Ikar, Zig, Sachak, Sáh, Tibetan (Bhotia); *Bharal he* of hills north of Simla; *Thurwágh,* Kunawar.

Fur long, dense, and rather woolly. Tail thick, scarcely tapering, about three quarters the length of the head and body.

The skull differs greatly from that of a leopard, being much higher and more convex when viewed from the side, with a depression at the posterior termination of the nasal bones, which are broad and short; the postorbital processes, too, are less bent down. The face in front of the orbits is very short.

Colour. Ground-colour above very pale whitish grey, sometimes with a yellowish tinge, below white; the whole animal spotted with black. The spots on the back, sides, and tail are large, black, interrupted rings or rosettes of rather irregular shape, much larger than in leopards, the space inside each ring being usually rather darker than the ground-colour; spots on the head, limbs, and terminal portion of the tail without pale centres; the spots on the belly few in number and rather indistinct. From near the middle

of the back to the root of the tail is a median dark band. Ears black, each with a large yellowish spot.

Dimensions. Head and body about 4 feet 4 inches, tail 3 feet, height 2 feet. A skull measures about 6 inches in basal length, and 4·75 in zygomatic breadth.

Distribution. High Central Asia, especially Tibet, extending north to the Altai, and west, it is said, into Persia. This, however, and the reported range still further to the westward into Armenia, is somewhat doubtful; the peculiar pale-coloured variety of leopard found in Western Asia (*F. tulliana*) may have been mistaken for an ounce (see Alston, P. Z. S. 1880, p. 51). The ounce is found throughout the Himalayas at high elevations, and is more abundant on the Tibetan side of the Snowy Range, where it is met with in the Upper Indus and Sutlej valleys. It is fairly common in Gilgit. It is known to sportsmen as the snow leopard.

Habits. Not much is known of the ounce's life-history. It lives amongst rocks at considerable elevations, never, it is said, below 9000 feet above the sea in the Himalayas. This, however, may be in summer; for Scully relates that in Gilgit the ounce descends as low as 6000 feet in winter. It preys upon wild sheep and goats (ibex, markhor, and thár), and probably upon any rodents (marmots, hares, *Lagomys*, &c.) or birds it can capture; it carries off sheep, goats, and dogs from villages, and even kills ponies, but, it is said, has never been known to attack man.

32. **Felis nebulosa.** *The clouded Leopard.*

Felis nebulosa, *Griffith, Carnivora*, p. 37, plate (1821).
Felis diardi, *Cuv. Oss. Foss.* ed. nouv. (2e) iv, p. 437 (1823); *Blyth, P. Z. S.* 1863, p. 183; *Jerdon, Mam.* p. 102; *Elliot, Mon. Fel.* pl. viii.
Felis macrocelis, *Temminck, Horsf. Zool. Journ.* i, p. 543 (1825); *Tickell, J. A. S. B.* xii, p. 814; *Blyth, Mam. Birds Burma*, p. 27.
Felis macroceloides, *Hodgs. Calc. Journ. N. H.* iv, p. 286 (1844) (no description); *id. P. Z. S.* 1853, p. 192, pl. xxxviii; *Blyth, Cat.* p. 58.

Pungmar, Satchuk, Lepcha; *Zik*, Limbu; *Kung*, Bhotia; *Lamchitia*, Khas tribe, Nepal; *Thit-Kyoung*, Burmese; *Arimau dahan* (tree tiger), Malay; *Clouded Tiger* of British naturalists.

Size of a small leopard. Pupil oval, vertical. Tail thickly furred, nearly the same thickness throughout, and long, about four fifths the length of the head and body. Caudal vertebræ 25.

Skull long, low, and narrow. Orbit widely open behind. Hinder termination of bony palate concave; mesopterygoid fossa narrow. Lower edge of mandible straight from symphysis to near the angle, then concave. The upper canines are longer relatively than in any other living cat, and have a very sharp edge posteriorly. Anterior upper premolar frequently but not always wanting.

Colour. General tint varying from greyish or earthy brown (cat-grey) to fulvous (light yellowish brown); lower parts and

inner side of limbs white or pale tawny. Head spotted above; two broad black bands, with narrower bands or elongate spots between them, commence between the ears, run back to the shoulders, and are prolonged, more or less regularly, as bands of large oval or elongate marks along the back. Sides of body usually divided into large subovate, trapezoidal, or irregularly shaped darker patches

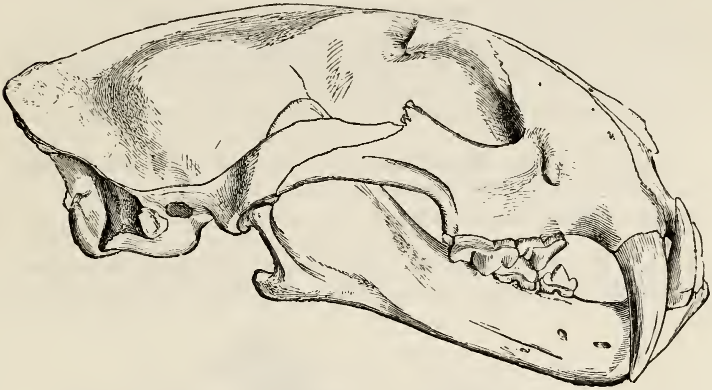

Fig. 17.—Skull of *Felis nebulosa*. (Gray, P. Z. S. 1867, p. 266.)

by narrow pale bands, the patches in places edged with black, especially behind. In old specimens the dark patches are sometimes indistinguishable, but the black edges remain as irregular stripes. The limbs and underparts are marked with large black spots. Tail with numerous dusky rings, often interrupted at the sides, those near the body traversed above by a longitudinal band. Ears black externally, often with a grey spot in the middle. Two black horizontal cheek-stripes, the upper running from the eye; the margin of the upper lip also black laterally in some specimens. There is an irregular black band across the chin and another on the throat. Blyth states that this animal grows more fulvous with age, the greyer skins being those of young animals.

Dimensions. An old male, measured by Hodgson, was $37\frac{1}{2}$ inches long from snout to vent; tail with hair at end 30, without 29; height $14\frac{1}{2}$, length of ear $2\frac{3}{8}$; weight $44\frac{1}{2}$ lbs. In another specimen the head and body measured $3\frac{1}{2}$ feet, tail 3. A skull larger than usual, from Assam, is 6·2 inches long from the foramen (basal length), and 4·75 broad across the zygomatic arches; another skull 4·7 by 3·6.

Distribution. The clouded leopard occurs in the South-eastern Himalayas, Sikhim, Bhutan, &c., at moderate elevations, probably not above 7000 feet. It is also found in the Assam hills and throughout the hilly parts of Burma, Siam, the Malay Peninsula, Sumatra, Java, and Borneo. A variety with a shorter tail (*Leopardus brachyurus*, Swinhoe) has been obtained in Formosa.

Habits. Very little is known of the habits of this animal, all that has been recorded hitherto about it in the wild state being derived from the accounts given by native hunters. It is believed to be thoroughly arboreal, living and sleeping in trees, and preying upon birds and mammals. In captivity it appears not difficult to tame.

33. **Felis marmorata.** *The marbled Cat.*

Felis marmorata, *Martin, P. Z. S.* 1836, p. 108; *Blyth, Cat.* p. 59; *id. P. Z. S.* 1863, p. 183; *Jerdon, Mam.* p. 104; *Elliot, Mon. Fel.* pl. ix.
Felis charltoni, *Gray, A. M. N. H.* xviii, p. 211 (1846); *Blyth, Cat.* p. 59.
Leopardus dosul, *Hodgs. Cat. Mam. &c. Nepal, B. M.* 2nd edit. 1863, p. 3 (no description).

Sikmar, Bhotia; *Dosal*, Lepcha.

Larger than a domestic cat. Tail bushy, nearly the same thickness throughout, about three quarters the length of the head and

Fig. 18.—*Felis marmorata.* (Elliot, Mon. Fel.)

body. Fur soft, thick, with woolly underfur (at all events in Himalayan skins). Ears short, rounded at the end. Bony orbit complete behind in old skulls. The posterior edge of the bony palate deeply concave. Anterior upper premolar apparently often wanting.

Colour. Ground-colour varying from brownish grey (earthy brown) to bright yellowish or rufous brown, lower parts paler. The sides divided by narrow pale streaks into large, irregularly shaped darker patches, black on the hinder edges. Along the back are angular black blotches or irregular rings, arranged more or less

in longitudinal bands. There are black spots on the outside of the limbs, the upper surface of the tail, and usually on the lower parts; but those on the belly are very variable, being sometimes large and distinct, sometimes almost imperceptible. The inside of the limbs and the chest are banded or spotted, and there are the usual cheek-stripes. Two interrupted bands, one from the inner corner of each eye over the head, are continued as well-marked black stripes on the hind neck, spots or bands intervening between them on the head but not on the neck. The underfur is rich brown. According to Blyth, the ground-colour becomes more fulvous with age.

Dimensions. Length of head and body 18½ to 23 inches, tail 14 to 15½, ears from crown of head 2 (*Jerdon*). The basal length of a skull is 2·95 inches, zygomatic breadth 2·6.

Distribution. The marbled cat is found in Sikhim and the Eastern Himalayas, and in the hilly regions of Assam, Burma, and the Malay countries, extending to Sumatra, Java, and, it is said, Borneo. This animal has not been recorded from Nepal.

Habits. Nothing known. *F. marmorata* is probably arboreal, like the similarly coloured *F. nebulosa.* In Sikhim it is said to be shy and fierce.

34. **Felis temmincki.** *The golden Cat.*

Felis temminckii, *Vigors & Horsf. Zool. Journ.* iii, p. 451 (1828); *Elliot, Mon. Fel.* pl. xvi.
Felis moormensis *, *Hodgs. Gleanings in Science,* iii, p. 177 (1831); *id. P. Z. S.* 1832, p. 10; *Elliot, P. Z. S.* 1871, p. 759.
Felis aurata, *Blyth, P. Z. S.* 1863, p. 185; *Jerdon, Mam.* p. 107 *Sclater, P. Z. S.* 1867, p. 816, pl. xxxvi, *nec Temm.*
Felis nigrescens, *Hodgs. Cat. Mam. &c. Nepal, B. M.* 2nd edit. p. 4 (no description).

Size rather less than that of *F. nebulosa.* Pupil very slightly elliptical in a strong light, round in general. Tail about two thirds the length of the head and body, almost the same thickness throughout. Caudal vertebræ 22. Ears short, rounded. Fur of moderate length, dense, rather harsh.

Skull with the orbits nearly complete behind. Lower surface of presphenoid very narrow and bordered by parallel lines.

Colour. Deep ferruginous or chestnut, darker (bay) along the back, paler on the sides, still paler and whitish below; chin and lower surface of tail to the tip white, the tip above is dusky. There are some round dusky spots on the breast, between and behind the axils, and, in some specimens, on the inside of the fore limbs, and less distinct markings, forming imperfect bands, on the throat. The lower side of the tarsi and feet are brown. The markings on the face are peculiar and somewhat variable; the most conspicuous is a horizontal white or buff cheek-stripe, sometimes edged with black, from below the eye to behind the gape; a whitish band

* The spelling was subsequently corrected to *murmensis* by Hodgson himself in several publications, *e. g.* Calc. Journ. Nat. Hist. iv, p. 286.

inside each eye; and occasionally curved lines running back from above the eye to between the ears. Ears black or brownish black outside, with an ill-defined pale central spot. Fur brown at the base, ferruginous near the end, some black tips on the back.

A variety of a dark brown colour also occurs (*F. nigrescens*, Hodgson), both in Nepal and Tibet. It has the same white under-surface to the tail.

Dimensions. A fine male, according to Hodgson, who saw the animal alive, measured, length of head and body 31·5 inches, tail 19, height at the shoulder 17, length of ear 2·5. An adult skull from Nepal, in the British Museum, measures 4·8 inches in basal length, and 3·65 in zygomatic width.

Distribution. The South-eastern Himalayas, at a moderate elevation; rare in Nepal, more abundant in Sikhim. Found also in Tenasserim, Sumatra, and Borneo, and probably throughout Burma and the Malay Peninsula. Mason mentions an animal known to the Burmese as the fire-cat or fire-tiger, from its red colour; and Theobald saw a specimen caged at Moulmain. A suggestion has recently been made in the 'Taprobanian,' i, p. 33, that this species may be found in Ceylon, but this is improbable.

Habits. Unknown. Several specimens have been obtained alive; there was one for some time in the Zoological Gardens, London, and another in Calcutta. This cat does not appear easily tamable.

35. **Felis viverrina.** *The fishing Cat.*

Felis viverrina, *Bennett, P. Z. S.* 1833, p. 68; *Blyth, P. Z. S.* 1863, p. 184; *Jerdon, Mam.* p. 113; *Blyth, Mam. Birds Burma*, p. 27; *Elliot, Mon. Fel.* pl. xxii.
Felis viverriceps, *Hodgs. J. A. S. B.* v, p. 233 (1836); *Kelaart, Prod.* p. 46.
Felis himalayanus, *Jardine, Nat. Lib., Felinæ*, p. 230, pl. 24* (1837).
Felis celidogaster, *Blyth, Cat.* p. 61, *nec Temm.*

Banbiral, Báráun, Khupya-bágh, Bágh-dásha, H.; *Mach-bágral,* Beng.; *Hándún-diva,* Cingalese.

Size larger than that of the domestic cat, limbs short and strong, head elongate, ears short and rounded. Fur coarse, without any gloss. Tail about one third the length of the head and body. Caudal vertebræ 19. Pupil circular.

Skull long, occipital and sagittal crests well-developed; muzzle narrow, compressed, elongate; nasal bones long, broad anteriorly, concave on the outer margin. Orbit complete or nearly complete behind in adults. Lower margin of mandible nearly or quite straight. Teeth large.

Colour. Earthy grey, with a more or less marked brownish tinge, darker and browner on the back, paler and whiter below, spotted throughout with black or dark brown. The spots are always much longer than broad, but they vary much in size, sharpness, and definition in different animals; in some they are small and comparatively indistinct, owing to an admixture of grey-tipped hairs;

in others well-marked and about an inch in length on the sides. From 6 to 8 black lines run from the forehead to the nape, breaking up into shorter lines and spots on the shoulders, but continued as lines of spots down the back. Cheeks greyish white, usually with two well-marked horizontal black or brown cheek-stripes. Several cross bands more or less distinct on the throat and fore neck. Markings on limbs variable; sometimes there are none, but usually there are bars or lines of spots outside the thigh and forearm, and the usual two bars inside the latter. Lower parts spotted. Tail more or less distinctly ringed with black above. Underfur brown, only the longer hairs with a long whitish portion near the end and a black tip; in the spots all the terminal part is black. Feet brown beneath.

Dimensions. Head and body 30 inches, tail $10\frac{1}{2}$ (or with hair $11\frac{1}{2}$), height 15; weight 17 lbs. The above are the measurements and weight of a male, but some specimens are larger. Kelaart gives head and body $34\frac{1}{2}$. A large skull (I have seen even larger) measures 4·85 inches in basal length and 3·5 across the zygomatic arches; another 4·7 by 3·6; a small but quite adult skull 4·2 and 3·05.

Distribution. Bengal, probably Orissa, and the Indo-Gangetic plain generally, extending as far as Sind, whence I have a good specimen procured by Mr. H. E. Watson near Sehwan. Unknown in the peninsula of India, except on the Malabar coast, where it occurs from Mangalore to Cape Comorin, but not, so far as is known, to the northward near Bombay. This species occurs also in Ceylon. Along the base of the Himalayas the fishing cat is met with as far west as Nepal, and ranges throughout Burma, Southern China, and the Malay Peninsula. So far as is known, *F. viverrina* does not appear to be found in the Malayan islands, but it is said to exist in Formosa.

Habits. This species haunts marshy thickets near rivers, swamps, or tidal creeks, and differs from most cats in feeding upon fish. It also, according to Buchanan Hamilton, eats freshwater mollusca such as *Ampullaria* and *Unio*, both of which abound in many of the Indian swamps. Hodgson found that one specimen brought to him had eaten a large snake. The fishing cat, however, like other members of the genus, doubtless kills such mammals and birds as it can. It is said to be very ferocious; both in Bengal and in Malabar it has been known to kill calves, and sheep are not unfrequently destroyed by it. Mr. Baker wrote from Malabar that it often killed pariah dogs, and he had known young infants carried off by it from their parents' huts. A still more remarkable instance of its ferocity is mentioned by Blyth, a newly caught male of this species in his possession having killed a tame young leopardess of twice its own size, after breaking through the partition that separated the cages.

Frequently *F. viverrina* is savage in confinement, but Blyth says he had several males perfectly tame and considered this a particularly tamable species.

36. **Felis bengalensis.** *The leopard Cat.*

Felis bengalensis, *Kerr, Animal Kingdom*, p. 151 (1792); *Blyth, Cat.* p. 60; *id. P. Z. S.* 1863, p. 184; *Jerdon, Mam.* p. 105; *Anderson, An. Zool. Res.* p. 164; *Elliot, Mon. Fel.* pl. xxi; *Blanford, P. Z. S.* 1887, p. 627.
Felis javanensis, *Desmarest, Nouv. Dict. Hist. Nat.* vi, p. 115 (1816); *Horsf. Zool. Res. Java*, pl.
Felis sumatrana *Horsf. Zool. Res. Java*, pl. (1824).
Felis minuta, *Temm. Mon. Mam.* i, p. 130 (1827).
Felis nipalensis, *Vig. & Horsf. Zool. Journ.* iv, p. 382 (1829).
Felis chinensis, *Gray, Charlesworth's Mag. N. H.* i, p. 577 (1837).
Leopardus ellioti *and* Leopardus horsfieldii, *Gray, A. M. N. H.* x, p. 260 (1842).
Felis pardochrous, *Hodgs. Calc. Journ. N. H.* iv, p. 286 (1844), no description.
Felis ogilbii, *Hodgs. Calc. Journ. N. H.* viii, p. 44.
Felis jerdoni, *Blyth, P. Z. S.* 1863, p. 185; *Jerdon, Mam.* p. 107.
Felis undata, *Blyth, Mam. Birds Burma*, p. 27, *nec Desmarest.*
Felis wagati *and* Felis tenasserimensis, *Gray, P. Z. S.* 1867, p. 400.
Felis herschelii, *Gray, Cat. Carn. &c. Mam. B. M.* p. 28 (1869).
Felis javensis, *Elliot, Mon. Fel.* pl. xxviii (1883).

Chita Billa, H.; *Ban Biral*, Beng.; **Wagati*, Mahr. of Ghats; *Thit-Kyoung*, Arakan; *Kye-thit, Thit-kyúk, Kya-gyúk*, Burmese; *Kla-hla*, Talain and Karen; *Rimau-ákar*, Malay.

Fig. 19.—*Felis bengalensis.* (Elliot, Mon. Fel.)

About the size of a domestic cat or rather smaller, but with longer legs. Tail rather less than half the length of the head and body together, sometimes perhaps not more than one third, but some measurements give more than one half. Ears moderate, rounded at the tip. Pupil circular (perhaps elliptical in strong light).

The skull is rather elongate, low and convex. Orbit incomplete behind. The inner lobe of the upper flesh-tooth small. Anterior upper premolar rarely deficient.

Colour. Ground-colour above pale fulvous, varying from rufous to greyish, below white, ornamented throughout with numerous more or less elongate, well-defined spots, either black throughout,

or, especially on the sides, each spot partly black and partly brown, the two colours passing into each other. The fur is brown at the base, and many of the fulvous hairs have white tips, producing a grizzled appearance on the ground-colour. The size of the spots is very variable; they have a general tendency to a linear arrangement, especially on the back. The limbs and underparts are all spotted, the spots on the belly being as a rule, though not always, well defined, and there are spots on the upper surface of the tail, the lower surface of which is generally unspotted, but spots are frequently met with in Himalayan and Burmese varieties. Towards the end of the tail the spots usually become small transverse bars. There is almost always a white band running up to the forehead from the inside of each eye. Four longitudinal black bands commence on the forehead, and are continued over the head to the hind neck, breaking up into short bands and elongate spots on the shoulders; less distinct bands or spots occasionally come in between the two median head-stripes on the forehead and shoulders, but these two stripes frequently coalesce on the back of the neck, diverging again between the shoulders and being continued as rows of spots to the tail. There are generally two well-marked horizontal cheek-stripes, the lower of which is often joined to a transverse stripe across the throat; other transverse stripes, sometimes broken into rows of spots, cross the lower neck and breast. There are the usual two dark bands inside the forearm, and a large whitish spot on the black outside surface of each ear.

In kittens the general colour is pale brown, and the markings are ill-defined.

The coloration of this species is so variable that it is difficult to give a description that is applicable to all the varieties.

Dimensions. Head and body 24 to 26 inches, tail 11 to 12 or more (*Jerdon*). Some varieties are considerably smaller; a Burmese specimen measured by Tickell had the above two measurements only 16 and 9·5 inches. A large Nepalese skull is 3·1 inches in basal length from the foramen to the premaxillaries, and 2·5 wide across the zygomatic arches; whilst in the small Burmese variety (*F. wagati* of Gray) the length and breadth of a skull similarly measured are only 2·7 and 2·1 inches.

Distribution. The leopard cat is common in the Himalayas as far west as Simla, in Lower Bengal, Assam, the Burmese and Malayan countries, Southern China, Sumatra, Java, Borneo, and the Philippines. It is also found in the Syhádri Range or Western Gháts of India, Coorg, Wynaad, Travancore, &c., and in some, perhaps all, of the other forest-regions of the peninsula, though not very abundantly. I have never seen a specimen during several years' wanderings in the Central Provinces and the northern part of the Bombay Presidency. There is, however, a skin said to be from the neighbourhood of the Coromandel coast in the Calcutta Museum; and a living specimen from Jeypore, west of Vizagapatam, was quite recently given to the Zoological Gardens in London by Mr. G. T. Egan. According to Jerdon *F. bengalensis* is also found

in Ceylon, but this I doubt; its occurrence is not mentioned by Kelaart, Blyth, or Tennant, nor is there a specimen from the island in the British Museum, which is well supplied with Cingalese Mammalia.

Varieties. In this species the tendency to variation in markings appears to reach its maximum so far as Asiatic cats are concerned, though the American ocelot is at least equally variable. The variation is shown by the number of synonyms this animal has received, and by the great difference in the number of the species into which it has been divided by different naturalists.

After examining the fine series of skins and skulls in the British Museum I have come to the same conclusion as Blyth and Jerdon, and class all the various races as varieties of a single species. As in many other cats, there is a grey phase, to which belong *F. nipalensis*, *F. jerdoni*, *F. javanensis*, *F. chinensis*, and a rufous phase. According to Blyth (Cat. Mam. A. S. p. 60, and P. Z. S. 1863, p. 184, note), some of the grey forms, and especially *F. nipalensis*, are hybrids with domestic cats. There is considerable variation, too, both in size and in the length of the tail.

The following are the principal named varieties:—

The ordinary Himalayan type, *F. pardichroa* of Hodgson, has pale rufescent back and sides, with spots usually subangular or angular in form, each spot black behind and brown in front. In some specimens the spots are large and almost triangular with the points directed backwards, in others the spots are simply elongate ovals and of small size. *F. nipalensis* is only a grey phase, and, as already remarked, was perhaps founded on a hybrid. There is, however, one variety unnamed, the specimen of it in the British Museum having been received in that collection from the East India Museum after the death of Dr. Gray. In this the black spots tend to form longitudinal lines and to enclose bands of rich rufous brown between them, the bands being more or less broken up into large rosettes, dark brown inside and bordered by imperfect black rings; the pale rufescent ground-colour occupies but a small portion of the surface. This is the most beautiful form I have seen. According to Mr. Blyth, there is a similar specimen in Calcutta.

The small race called *F. wagati* by Dr. Gray is, I believe, not the *Wagati* of Sir W. Elliot*, for the specimens are all labelled Moulmain, and are probably the Burmese form. Judging from comparison with a single specimen from the peninsula of India, the Burmese and Southern Indian races are very similar†, except that the latter is larger; the ground-colour in both is light with large distinct elongate black spots. *F. tenasserimensis* is founded on a flat skin, and differs in no important character. Further south in the Malay Peninsula and the Malay Islands, extending to Borneo and the Philippine Islands, is another small form, *F. minuta* v.

* Madras Jour. Lit. Sci. x, p. 108.

† According to McMaster (Notes on Jerdon, p. 29) Burmese individuals are smaller and more richly marked than those from the Western Ghâts.

sumatrana, with smaller and more numerous rounded black spots. Some specimens appear to have a decidedly shorter tail than typical *F. bengalensis*, but others have the tail as long as in the normal form. *F. javanensis* (of Horsfield and Gray, *F. javensis* of Elliot in part) is a peculiar small grey form with very small spots, those on the back elongate but deep blackish brown rather than black, those on the sides brown. *F. jerdoni*, as represented by two specimens in the British Museum, both named by Blyth, and one of which must be considered the type, is merely a smaller form, absolutely indistinguishable from *F. javanensis* so far as markings and structure are concerned; there is no evidence of the locality whence these specimens came, but they are probably Malayan.

Habits. F. bengalensis is only found in forests, where it preys on birds and small quadrupeds. In Coorg, Jerdon was informed that it lived in hollow trees, and carried off poultry from villages. Jerdon also quotes Hutton to the effect that this cat breeds in May, and has only 3 or 4 young, in caves or beneath masses of rock.

All observers agree that *F. bengalensis* is excessively savage and untamable. Usually when caged it remains crouched in a corner during the daytime and snarls at all who come near. But a specimen that I have recently seen in the Zoological Gardens, Regent's Park, paced its cage, came when called by its keeper, and appeared thoroughly tame. This is the individual, already mentioned, from Jeypore in the Madras Presidency.

37. **Felis rubiginosa.** *The rusty-spotted Cat.*

Felis rubiginosa, *I. Geoffr. Bélanger, Voy. Indes Or., Zoologie*, p. 141, pl. 6 (1834); *Kelaart, Prod.* p. 47; *Jerdon, Mam.* p. 108; *Holdsworth, P. Z. S.* 1871, p. 756; *Elliot, Mon. Fel.* pl. xxix.

Namali pilli, Tamil, Madras; *Verewa puni*, Tamil, Ceylon; *Kula diya*, Cingalese.

Size smaller than that of an ordinary domestic cat. Tail about half the length of the head and body. Fur short and soft. Ears small, rounded at the end. Two upper premolars on each side; the anterior pair are wanting, as in the lynxes. The bony orbit is complete behind.

Ground-colour above and on the sides rufescent grey, below white, body and limbs spotted. Some Ceylon specimens are bright ferruginous with a slight greyish tinge only. The fur of the upper parts is hair-brown, varying in depth of shade, at the base, then pale brown; numerous longer hairs are intermixed, in which the pale brown passes into rufous brown followed by a white ring, the tip being rufous to dark brown. The spots on the back and sides are brown to pale ferruginous, darker on the back, paler and redder on the sides; all are small, somewhat elongate, especially on the back, and arranged in longitudinal lines. The spots on the belly are dark brown and larger. In the ferruginous Ceylon variety none of the spots are red, all are brownish black. Four dark lines, sometimes with one or two shorter broken bands

in the middle, run from the eyes and base of the nose over the head, almost without interruption, and the two inner are continued between the shoulders as two well-marked, elongate, slightly diverging stripes without any other spots or bands between them. Behind the shoulders the bands are continued in the form of spots, other spots intervening. Cheek-stripes and throat-bands as in other cats, but usually ferruginous, the bands outside the forearm dark brown. There is a well-marked dark band inside each eye. Ears outside brown, with a large pale spot on each. Tail rufous grey, nearly the same colour as the back above, much paler below, finely punctulated, but without any distinct spots or stripes.

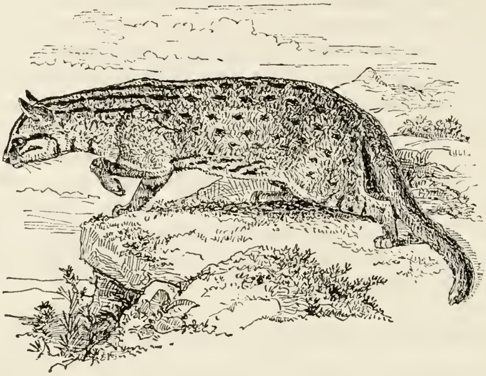

Fig. 20.—*Felis rubiginosa.* (Elliot, Mon. Fel.)

Dimensions. Head and body 16 to 18 inches, tail 9·5. A skull measures 2·55 inches in basal length and 2·05 in breadth across the zygomatic arches.

Distribution. Southern India and Ceylon. Unknown on the Malabar coast, but not uncommon in the Carnatic. Sterndale also obtained it at Seoni in the Central Provinces, but it appears to be rare so far north.

Habits. Jerdon says:—"This very pretty little cat frequents grass in the dry beds of tanks, and occasionally drains in the open country and near villages, and is said not to be a denizen of the jungles. I had a kitten brought to me when very young in 1846 and it became quite tame, and was the delight and admiration of all who saw it. Its activity was quite marvellous, and it was very playful and elegant in its motions. When it was about eight months old, I introduced it into a room where there was a small fawn of the gazelle, and the little creature flew at it the moment it saw it, seized it by the nape, and was with difficulty taken off. I lost it shortly after this. Sir W. Elliot notices that he has seen several undoubted hybrids between this and the domestic cat, and I have also observed the same."

It is doubtful whether Jerdon's information as to this cat not living in jungles is correct, for Holdsworth found it inhabiting forests in Ceylon. Sterndale had two young kittens at Seoni and fully confirms Jerdon's account of their being easily tamed, exceedingly graceful and agile. A young village cat which, after one of the pair died, he obtained as a companion to the survivor, was far inferior in activity and in its power of climbing.

Another cat that has been procured from the Malay Peninsula, Sumatra, and Borneo, and which, although not hitherto recorded from any locality further north than Province Wellesley, may possibly be found to extend into the southern portion of the Tenasserim Provinces, is *F. planiceps*, Vigors. The following description will enable this species to be recognized:—

F. planiceps. About the size of a domestic cat. Tail short, a quarter to a third the length of the head and body. Orbits completely enclosed by bone, and the anterior upper premolar larger and better developed than in any other living cat, having two roots. Colour dark rich red-brown above, the fur having a silvery speckled appearance, owing to an intermixture of hairs with white tips; below white, more or less spotted or splashed with brown.

38. **Felis manul.** *Pallas's Cat.*

Felis manul, *Pallas, Reise Russ. Reichs*, iii, p. 692 (1776); *Elliot, Mon. Fel.* pl. x.
Felis nigripectus, *Hodgs. J. A. S. B.* xi, p. 276, with plate (1842).

Size of a domestic cat. Fur soft, long and very thick. Ears short and rounded. Tail very thick, bushy, cylindrical, about half the length of the head and body.

The skull is of very peculiar shape, being remarkably broad for its length everywhere. The orbits, too, are directed forward more than in any other cat. The upper surface of the skull is highly convex. The muzzle is broad, the nasals of moderate size, slightly concave on the outer margins. The teeth are well developed, the inner lobe of the flesh-tooth very small, and in the only skull I have examined the anterior upper premolar was wanting on both sides.

Colour. Silvery grey to yellowish buff, with a silvery wash above, darker on the back; breast brown, remainder of lower parts white. Fur brown at the base, then buff or grey; ends of long hairs white with black tips on the back. Across the loins are a few more or less distinct black transverse stripes, narrow and far apart, and on the tail are 6 or 7 nearly equidistant narrow black rings and a black tip. In some specimens, too, there are a few black transverse stripes on the limbs. The head is spotted above, and there are the usual two dark horizontal stripes across each cheek.

Dimensions. Head and body of a male $18\frac{3}{4}$ inches, tail $8\frac{1}{4}$, height 9, length of ear $1\frac{3}{16}$ (*Hodgson, MS.*). A skull measures in basal length 3 inches, breadth across zygomatic arches 2·8. Weight according to Pallas 6 to $7\frac{1}{2}$ lbs.

Distribution. Tibet, extending into Ladák, whence there is a specimen, procured by General R. Strachey, in the British Museum collection. The species, however, does not appear to have been observed on the south side of the main Himalayan range. To the northward *F. manul* is found as far as Siberia, being common in Mongolia.

Habits. According to Pallas this cat lives amongst rocks in the deserts of Central Asia, and feeds on small animals.

39. **Felis ornata.** *The Indian desert Cat.*

Felis ornata, *Gray, Hardwicke's Ill. Ind. Zool.* i, pl. 2 (1832), bad figure; *id. P. Z. S.* 1867, p. 401; *Blyth, J. A. S. B.* xxv, p. 441; *id. Cat.* p. 63; *Elliot, Mon. Fel.* pl. xxxii; *Thomas, P. Z. S.* 1886, p. 55.
Felis servalina, *Jardine, Naturalists' Library, Felinæ*, p. 232, pl. 25 (*F. ornata* on plate).
Felis torquata, *Blyth, P. Z. S.* 1863, p. 185, *partim*; *Jerdon, Mam.* p. 110, *partim* (*nec F. Cuv.*, Chat du Nepal, *Hist. Nat. Mam.* pl. 126).

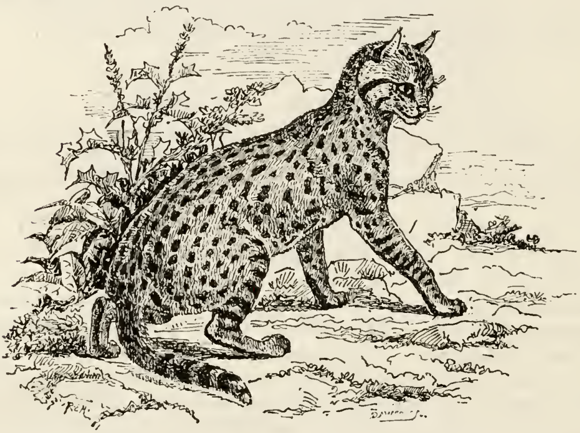

Fig. 21.—*Felis ornata.* (Elliot, Mon. Fel.)

Size of a domestic cat. Tail tapering, about half the length of the head and body. Ears well developed, pointed. Fur short.

The skull is broader and shorter than those of *F. chaus* and *F. bengalensis.* Lower edge of mandible very convex. Inner lobe of upper flesh-tooth well developed, being quite as large as the anterior outer lobe, or larger.

Colour. Very pale sandy (fulvescent grey or light isabelline), with numerous small black roundish spots on the body, and still smaller elongate spots on the crown and nape, those on the crown having a tendency to form longitudinal bands. Fur of back dusky grey near the base, thence to near the end pale rufescent, tip still paler. There are some narrow black cross lines outside the limbs, and two distinct black bars inside each forearm, also the usual cheek-stripes, which are brown. The lower parts are pale rufescent, with a few

black spots; the chin, throat, and front of the breast white and unspotted, the fore neck rufescent. Ears externally the same colour as the back, with a few elongate brown hairs at the end. Tail with some black transverse bands above, which form rings towards the end; the tip is black. Paws black beneath.

Dimensions. Head and body 18 to 22 inches, tail 9 to 10, hind foot from calcaneum 4·5. Basal length of an adult female skull 3·25, zygomatic width 2·75; a smaller male skull 2·85 by 2·35. The sexes do not appear to exhibit any constant difference in size.

Distribution. Throughout the drier regions of Western India, from the Punjab and Sind to Saugor and Nágpúr, not extending, however, to the Gangetic valley, and rare south of the Nerbudda. It is common in the Indian deserts east of the Indus, in Sind, Western Rájputána, and Hurriana.

Habits. The desert cat inhabits sandy plains and sand-hills, where its principal food in all probability consists of *Gerbilli* (*G. hurrianæ*). It is not found in wooded country. It is not by any means particularly nocturnal.

According to Dr. Scott, as quoted by Blyth, this cat, like *F. rubiginosa*, *F. chaus*, and other species, breeds with domestic cats, and in some parts of the country inhabited by *F. ornata* many of the village cats are similarly spotted.

Until recently this animal was represented by but two skins, one of them immature, in the British Museum collection. It appears to be also poorly represented in Calcutta. The receipt of six beautiful specimens and skulls, obtained near Sámbhar in Rájputána by Mr. H. M. Adam, and presented to the British Museum by Mr. Hume, has served to show that *F. ornata* is a well-marked species and distinct from *F. torquata*, to which it was united by Blyth and Jerdon.

A cat much resembling *F. ornata* is found inhabiting Eastern Turkestan, and was named by me *F. shawiana*. Although nearly allied to the Indian desert cat, *F. shawiana* appears to be larger with a shorter tail.

40. **Felis torquata.** *The waved Cat.*

Felis torquata, *F. Cuv. Hist. Nat. Mam.* pl. 126 (1826); *Jerdon, Mam.* p. 110, *partim*; *Thomas, P. Z. S.* 1886, p. 55.
Felis inconspicua, *Gray, Charlesworth's Mag. N. H.* i, p. 577 (1837).
? Felis huttoni, *Blyth, J. A. S. B.* xv, p. 169; xvii, p. 247, xxii, p. 581.

Size of a domestic cat. Tail tapering, about half the length of the head and body, or rather more. Ears rounded at tips.

Skull short and high, very similar to that of *F. ornata*. The minute anterior upper premolar, instead of being placed as in *F. ornata*, *F. caligata*, and many other cats, halfway between the second premolar and the canine, is close to the former in both the skulls examined, and in one there is an additional equally minute premolar in front, close to the canine. The position of the normal anterior premolar close to the second is common in domestic cats, Indian and European.

Colour. Ash-grey, varying in some skins to brownish or rufescent, lower parts buff. Fur on back grey at the base and sometimes throughout; in other skins it becomes rufescent, always having a dark brown or blackish subterminal portion, and a whitish or yellowish tip. Narrow longitudinal dark bands, often very indistinct, run along the crown and back; and there are numerous interrupted narrow dark brown or black transverse (vertical) bands or rows of spots on the sides, extending as cross rows of spots to the anterior portion of the abdomen. There are cross bands on the fore neck; the breast and lower abdomen remaining unspotted. The usual markings are found on the cheeks. Tail with more or less distinct black rings on the posterior half and a black tip. Paws black or dark brown beneath.

Dimensions. A male obtained in Kashmir measured—head and body 22 inches, tail 12. A female from Rájputána measured—head and body 20 inches, tail without hair at the end 10, with 10½, ears 2 outside, hind foot 4·9. In the fully adult skull of the latter the basal length is 2·95, zygomatic breadth 2·4.

Distribution. The type of *F. torquata* was said to be from Nepal; the exact locality of *F. inconspicua* is not recorded, but specimens precisely similar have been obtained by Captain Boys and Mr. Adam in Rájputána, and by Sir O. B. St. John in Kashmir. This cat must therefore be widely dispersed throughout Northern India, though it does not appear to be common.

Nothing especial is known of the habits, and it is far from improbable that specimens of the present form are merely descendants of tame cats that have run wild. The converse is, however, equally probable, that this is the aboriginal race from which Indian domestic cats, and possibly those of other countries are derived; and the circumstance that skins from parts of India so distant from each other as Nepal, Rájputána, and Kashmir are precisely similar is in favour of the latter view. The characters of the upper premolars distinguish *F. torquata* from the allied *F. caffra* (or *F. caligata*), to which, however, *F. huttoni*, described by Blyth from Afghanistan, may perhaps belong.

41. **Felis chaus.** *The jungle Cat.*

Felis chaus, *Güldenstädt, Nov. Com. Pet.* xx, p. 483, pls. 14, 15 (1776); *Kelaart, Prod.* p. 48; *Blyth, Cat.* p. 63; *id. P. Z. S.* 1863, p. 186; *id. Mam. Birds Burma*, p. 28; *Jerdon, Mam.* p. 111; *Elliot, Mon. Fel.* pl. xxxiii.
Felis catolynx, *Pallas, Zoog. Ros.-As.* i, p. 23, pl. ii.
Felis affinis, *Gray, Hardwicke's Ill. Ind. Zool.* i, pl. 3.
Felis kutas, *Pearson, J. A. S. B.* i, p. 75.
Felis (Lynchus) erythrotis, *Hodgson, J. A. S. B.* v, p. 233.
Felis jacquemontii, *I. Geoffr. Jacquemont, Voyage*, iv, p. 58, *Atlas*, ii. pls. ii, iii.

Jangli-billi, H.; *Khatás*, H. and Beng.; *Banberál*, Beng.; *Gúrba-i-Kuhi*, Pers.; *Bául*, *Bháoga*, Mahr.; *Berka*, Hill-tribe of Rajmahál; *Mant-bek*, Can.; *Kada bek* or *Bella bek*, Wadári; *Katu-punai*, Tam.; *Jurka pilli*, Tel.; *Cherru puli*, Mal.; *Kyoung tset-kun*, Arakanese.

Size exceeding that of a domestic cat. Pupil round. Ears often with a few longer hairs at the end, not amounting, however, to a distinct tuft as in the lynxes. Tail short, one third to two fifths the length of the head and body. Fur variable, short in specimens from plains of India, longer in Himalayan skins.

Skull strong, elongate, postorbital processes bending sharply downwards; the brain-case broad behind the postorbital processes; nasal bones broad anteriorly, more or less concave at the side. The lower jaw convex below. Inner lobe of upper flesh-tooth well developed, as large as the outer anterior lobe.

Colour of the body varying from sandy grey or yellowish grey to greyish brown; back darker, often rufescent, sometimes dusky; lower parts fulvescent or rufescent white. Fur in general fulvescent white (isabelline) from the base to near the tip, where it is greyish white, the tip being black, sometimes on the back rufous near the tip; the underfur near the body in some specimens brown. The limbs are sometimes transversely barred with dusky, sometimes not; there are usually the two broad dusky bands inside the forearm. Foot and tarsus dusky brown beneath. Tail ringed with black near the end, and the tip black. Cheek-stripes and band across breast sometimes present and of a pale ferruginous tint. Ears pale rufous outside, the tips generally blackish or black. There is some long whitish hair on the anterior portion of the ear inside.

In adult specimens there are usually no markings on the body or limbs, but exceptions occur. In some skins more or less distinct vertical rows of spots or wavy lines may be traced on the sides. A black variety is occasionally found, and Dr. Scott procured it both near Hansi and in the neighbourhood of Umballa.

Dimensions. Hodgson gives:—head and body 22 inches, tail with hair at the end 11, without 10, height at shoulder 16; weight 14 lbs. Jerdon's measurements are:—head and body 26, tail 9 to 10, height at shoulder 14 to 15; and of a large specimen killed at Umballa, total length 39 inches, height 18, weight 18 lbs. (Appendix, p. ii). A moderate-sized skull is 3·75 inches long (basal length), and nearly 3 broad across the zygomatic arches. In a large male skull the basal length is nearly 4 inches, in a small (? female) specimen 3·35.

Distribution. F. chaus is the common wild cat of India from the Himalaya to Cape Comorin, and from the level of the sea to 7000 or 8000 feet or perhaps higher on the Himalayas. It is found in Ceylon and also extends into Burma, but has not been recorded further east. A wild cat observed by Col. Tickell at the Andaman Islands (J. A. S. B. xxxii, p. 86) may perhaps have been this species. It has an extensive range through Western Asia and Northern Africa.

Habits. This cat frequents either jungles or open country, and is very partial to long grass, reeds, cornfields, sugar-cane fields, and similar places, being often seen in the neighbourhood of villages. It feeds on birds and small mammals, and is said to be especially destructive to partridges, peafowl, hares, and other game.

Jerdon was actually robbed by a jungle cat of a peafowl he had shot; and McMaster relates a similar incident that happened to himself. The same observer says that he shot one in Burma in deep black mud, where it was perhaps hunting for fish or crabs. The voice, according to Blyth, differs from that of the domestic cat.

The jungle cat is a very savage animal. McMaster says he was once charged by a large individual that he had wounded with shot. As a rule, even if captured young, *F. chaus* appears to be untamable, but exceptions occur. It frequently breeds, however, with the domestic cat of India, and some of the latter closely resemble it in colouring, although they are considerably smaller. It is said to breed twice in the year, and to have three or four young at a time.

42. **Felis caracal.** *The Caracal.*

Felis caracal, *Güldenstädt, Nov. Com. Pet.* xx, p. 500 (1776); *Blyth, Cat.* p. 64; *Jerdon, Mam.* p. 113; *Elliot, Mon. Fel.* pl. xli.

Siyáh-gush (black ears), Pers. and H.; *Tsogde,* Little Tibet (? Gilgit); *Ech,* Ladák (Vigne).

Size intermediate between *F. chaus* and *F. lynx.* Build slender, limbs long. Tail one third the length of the head and body. Ears long and pointed, with a long black tuft of hair at the end.

Skull convex above, facial portion short. Teeth well developed. Anterior upper premolar wanting; inner lobe of upper flesh-tooth moderate.

Colour above varying from rufous fawn-colour to brownish rufous, generally the former in Indian specimens, unspotted; below paler rufous or white, often with indistinct rufous spots. Fur nearly the same colour throughout, slightly paler near the roots, some white tips intermixed on the back, and in darker specimens black tips also, giving a peculiar grizzled appearance. Limbs and tail the same colour as the body, the tip of the latter sometimes black, but not always. Ears outside black, often mixed with white, inside white; a blackish spot on each side of the upper lip, and others, not always distinct, above each eye and on each side of the nose. A white or pale spot inside, and another below each eye.

Dimensions. Head and body 26 to 30 inches, tail 9 to 10, ear 3, height 16 to 18 inches. Basal length of skull 4·55 inches, breadth across zygomatic arches 3·8.

Distribution. Found in the Punjab, Sind, North-western and Central India, and the greater part of the Peninsula except the Malabar coast, but rare everywhere. Ball met with it in Chutia Nagpur. Unknown in Bengal and the Eastern Himalayas, but said by Vigne to be found in the Upper Indus valley *. Outside of India this species occurs in Mesopotamia, and perhaps on the

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* Perhaps only tamed specimens; see J. A. S. B. xi, p. 759.

highlands of Persia, in Arabia, and throughout a large part of Africa.

Habits. Very little appears to have been recorded concerning this animal in the wild state. It probably lives amongst bushes and grass, not in thick forests. It is said to prey on gazelles, small deer, hares, and birds, and frequently to capture birds as they fly off by springing upon them to a height of 5 or 6 feet from the ground. It is destructive to peafowl, floriken, cranes, and, doubtless, to partridges.

The caracal is easily tamed, and is trained to catch birds, such as peafowl, cranes, &c., and small deer, gazelles, hares, or foxes, and also to kill for sport—a favourite amusement in parts of India, according to Blyth, being to pit these cats against each other to kill pigeons out of a flock. The caracals are let loose amongst the pigeons feeding on the ground, and each cat often strikes down ten or a dozen birds before they can escape by flight. Some Indian princes are said to have kept a large number of caracals for the purpose of hunting. Vigne, who saw them used, says that their speed is, if possible, greater in proportion even than that of the hunting leopard.

Although the caracal has the long limbs, ears, skull, and dentition of a lynx, it wants the ruff, and has a fur better adapted to its tropical or subtropical haunts.

43. **Felis lynx.** *The Lynx.*

Felis lynx, *L. Syst. Nat.* i, p. 62 (1766); *Elliot, Mon. Fel.* pl. xxxix; *Scully, P. Z. S.* 1881, p. 201.

Felis isabellina, *Blyth, J. A. S. B.* xvi, p. 1178 (1847); *id. Cat.* p. 64; *id. P. Z. S.* 1863, p. 186.

Patsalan, Kishmiri.

A strongly built cat, high on the legs, with a short tail, less than one fourth the length of the head and body. Ears long, pointed, and with a long black tuft of hair at the end. Pupil round. Hair of the hinder part of cheeks lengthened and hanging down, forming a partial ruff. Fur soft, thick. Pads of feet more or less concealed by hair. Intestines shorter than in other cats, being only twice the length of the body.

Skull very convex above, the facial portion short and broad. Orbits incomplete behind. In adults there are only two upper premolars.

Colour varying from pale sandy grey (isabelline) to rufous fawn with a greyish wash, and in some (European) specimens to ferruginous red, lower parts white. In summer there are small black spots on the body, and these are persistent in some cases even in winter fur (probably in young individuals); but Asiatic specimens in winter coats are unspotted except on the flanks and limbs, and even there the markings are often wanting. The spots are evidently very variable. The fur is fawn-coloured with a more or less

rufous tinge, towards the roots the hairs are brownish; the tips of the longer hairs are white, some black tips being often intermixed on the back. Terminal portion of the tail black. Ears outside grey, with the margins, tip, and terminal tuft black. Some black hairs are intermixed with the ruff, and, in some cases, there is an imperfect dark band across the throat. There are sometimes blackish or black spots on the belly.

The Tibetan lynx was distinguished by Blyth as *F. isabellina* on account of its pale colour and of the hair on the toes being shorter. Both these differences are probably due to the Tibetan lynx living in open ground amongst rocks, whilst the common lynx of Europe dwells chiefly in forests. The lynx of Gilgit, where there is some forest, is intermediate in coloration; and I can find no constant character of importance by which *F. isabellina* is distinguishable from the common lynx. Some skins procured by Hodgson from Tibet are undistinguishable from Gilgit and Turkestan specimens.

Dimensions. Head and body 33 inches, tail $7\frac{3}{4}$; weight about 60 lbs. In a skull, the basal length is 4·6 inches, zygomatic breadth 4.

Distribution. Found in the Upper Indus valley, Gilgit, Ladák, Tibet, &c., also throughout Asia north of the Himalayas, and Europe north of the Alps.

Habits. The lynx is found in Gilgit at heights above 5000 feet, but occurs at a great elevation in Tibet, Captain Kinloch having shot a female and captured the cubs near Hanle when hunting *Ovis hodgsoni*, which does not descend below 14,000 or 15,000 feet in summer. In Tibet, as in Europe, this species has the character of being extremely bloodthirsty and savage. Scully mentions that a pair of them killed six sheep in one night near Gilgit. Lynxes prey on birds and on all mammals that they are able to kill, from goats to mice; but the stories told of their attacks upon animals the size of red-deer, *Cervus elaphus*, are scarcely credible. The keenness of sight and hearing in the lynx have long been famous; the animal is well known to be an excellent climber, and to lie in wait for his prey on trees. Lynxes have two or three young at a time, and usually hide them in caves and holes amongst rocks. The young are born with the eyes not opened. Young animals are easily tamed.

Genus **CYNÆLURUS**, Wagler, 1830.

The claws only partially retractile, always remaining partly exposed. Limbs longer than in any true cats. Body slender. Skull with the infraorbital foramen on each side very small, and frequently represented by two or more foramina. Inner lobe of the upper flesh-tooth quite rudimentary.

The only species generally admitted is *C. jubatus*; a peculiar form, with woolly hair and pale spots, from South Africa, has been distinguished as *C. laneus* (*Felis lanea*, Sclater, P. Z. S. 1877, p. 532),

but there is some question as to whether this is more than an accidental variety. Other nominal species will be found recorded in books.

44. Cynælurus jubatus. *The hunting Leopard.*

Felis jubata, *Schreber, Säugeth.* iii, p. 392, pl. cv (1778); *Jerdon, Mam.* p. 114; *Ball, P. A. S. B.* 1877, p. 169.
Felis guttata, *Hermann, Obs. Zool.* p. 38 (1804).
Cynailurus jubatus, *Blyth, Cat.* p. 65; *Elliot, Mon. Fel.* pl. xliii.

Chita, Laggar, H.; *Yuz* and *Yuz-palang*, Pers.; *Chitra*, Gond; *Chita puli*, Tel.; *Chircha* and *Sivungi*, Canarese; *Cheeta* of many European naturalists.

As long as the common leopard or panther, but much higher and more slender. Pupil round. Ears short and round. Fur coarse, hairs of neck somewhat lengthened, hair of belly rather long and shaggy. Tail more than half the length of the head and body.

Skull much resembling that of *F. uncia* in shape, high and broad, very convex above and wide behind the postorbital processes. The facial portion short and broad, nasals broad, maxillaries short and high. Orbits incomplete behind. Opening of posterior nares broad. Anterior upper premolar generally present.

Colour from tawny (pale brownish yellow) to bright rufous fawn above and on the sides, paler below, spotted almost everywhere with small round black spots without any pale centres, and not arranged in rosettes. Chin and throat buffy white, unspotted. A black line from the anterior corner of each eye to the upper lip, and another less marked, or a row of spots in some specimens, from the hinder corner of the eye to below the ear. Ear black outside, base and margins tawny. Tail spotted above; the spots, towards the end, passing into imperfect rings.

Young covered with long hair, grey in colour, without any spots. Sterndale states, however, that on clipping the hair the spots are found on the underfur. A young animal in the British Museum is figured by Elliot, and is brownish grey on the back, chocolate-brown on the legs and lower parts, with indications of darker spots. This is, doubtless, in process of change into the colour of the adult.

Dimensions. Length of head and body about 4·5 feet, tail 2·5, height 2·5 to 2·75 (*Jerdon*). A skull is 5·35 inches long in basal length, and 4·55 across the zygomatic arches.

Distribution. The hunting leopard is found throughout Africa and South-western Asia, extending from Persia to the countries east of the Caspian and into India. In this country it occurs throughout a great portion of the peninsula, from the Punjab through Rájputána and Central India to the confines of Bengal (I once saw a skin that had been brought in by a local shikári at Deoghar, in the Sonthál Pergunnahs, south of Bhágalpur, and Ball saw another, under similar circumstances, at Sambalpur), and in

the Deccan. How far south in India *C. jubatus* ranges does not appear to be recorded; the animal is not found on the Malabar coast, nor, according to Jerdon, in Ceylon, and its range is probably nearly the same as that of the Indian antelope. It does not appear to be found north of the Ganges, and it occurs nowhere east of India.

Habits. Being used in the chase, and considered an important or even necessary appanage to the state of many Indian princes, the hunting leopard is eagerly sought after by the particular class of men who capture wild animals; and as only the adult is valued, its habits are well known to those who occupy themselves with capturing and training it. Their accounts are, of course, like all such descriptions by uneducated men, in all parts of the world, a mixture of observed facts and traditionary fable; but some of their most interesting statements appear to be confirmed by independent testimony. In Sterndale's 'Mammalia of India and Ceylon,' p. 202, an admirable description of the capture of two hunting leopards is quoted from the 'Asian;' whilst Jerdon describes, from his own observation, the training of a young animal brought up in captivity, and quotes from Buchanan Hamilton *, Vigne †, and W. Elliot ‡ accounts of the method in which the "chita" is used to hunt antelope. A capital description is also given by McMaster §.

The principal haunt of this feline in India is in low, isolated, rocky hills, near the plains on which live antelopes, its principal prey. It also kills gazelles, nylgai (Jerdon once observed a pair stalking some of the latter), and doubtless occasionally deer and other animals; instances also occur of sheep and goats being carried off by it (a goat was once taken away by one from my own camp in Khándesh); but it rarely molests domestic animals, and has not been known to attack men. Its mode of capturing its prey is to stalk up to within a moderate distance of between 100 to 200 yards, taking advantage of inequalities in the ground, bushes, or other cover, and then to make a rush. Its speed for a short distance is remarkable, far exceeding that of any other beast of prey, even of a greyhound or kangaroo hound, for no dog can at first overtake an Indian antelope or a gazelle, either of which is quickly run down by *C. jubatus* if the start does not exceed about 200 yards. McMaster saw a very fine hunting leopard catch a black buck (*Antilope cervicapra*) that had about that start, within 400 yards. It is probable that for a short distance the hunting leopard is the swiftest of all mammals.

This animal, according to the accounts of the men who capture it, usually passes two days, after gorging itself, in resting in its lair, and on the third day repairs to a particular tree, which forms a rendezvous for other animals of the species. On this tree it

* The quotation is said to be from the 'India Sporting Review.'
† Travels in Kashmir, Ladak, &c. i, p. 41.
‡ Mad. Journ. L. S. x, p. 107.
§ Notes on Jerdon's Mammals of India, p. 32.

sharpens its claws, leaving marks that are recognized by the hunters, who capture the leopards by means of nooses made from the dried sinews of antelopes, and pegged to the ground around the tree. From the few accounts given of their habits in the wild state, it is apparent that these felines frequently hunt in pairs or families; hence, perhaps, the appearance of several at a particular spot, where they amuse themselves by playing about before going off to hunt.

As already mentioned, only adults are captured, Indian shikáris considering that the young can only be properly trained by the parents. The same view prevails in India with regard to falcons. The hunting leopard is easily tamed, about six months being required to reduce him to a complete state of obedience and to complete his training. Many of these animals, when tamed, are as gentle and docile as a dog, delighting in being petted, and quite good tempered even with strangers, purring and rubbing themselves against their friends, as cats do. They are usually kept, when tame, on a charpai or native bedstead, attached by a chain to the wall, and are not shut up in a cage. Young hunting leopards are, of course, soon domesticated, as was shown in the case of that commemorated by Jerdon. So far as I have heard, however, this animal has not been known to breed in captivity.

The method of hunting with the "chita," as described by several observers, is the following:—The leopard is hooded, so as to blindfold it; it is fastened by a thin cord attached to a leather belt round its loins or to a collar, and is taken on a bullock-cart to the neighbourhood of the antelope. The latter have no fear of the ordinary country carts, which they see daily, and there is, consequently, no difficulty in driving to within a short distance of the herd. The leopard is then unhooded and slipped, and, according to the distance at which the antelope may be, either springs towards them at once, or, taking advantage of inequalities in the ground, follows them at a run until he gets within such a distance as to enable him to make his rush with success. He usually seizes the buck, if there is one with the herd, but this is probably due to the fact that the buck is generally the last; and, as pointed out by Sir W. Elliot, the mir-shikáris (keepers) always endeavour to get the herd to run across them, when they drive on the cart and unhood the "chita." The leopard rushes at the antelope and fells it, it is said, by striking its legs from under it with his paw; he then seizes the quarry by the throat, and holds it until the keepers arrive. The antelope's throat is then cut, and some of the blood collected in the wooden bowl from which the hunting leopard is fed, and offered to the latter, who laps it eagerly, advantage being taken of the opportunity to slip on his hood again. A good hunting leopard is said sometimes to capture four bucks in a morning.

Baldwin, in the 'Large Game of Bengal,' states that the hunting leopard has occasionally been speared from horseback. It gives but a short run, and rarely shows fight. McMaster also relates an

instance of this animal being speared, and states that the hunting leopard, although at first it far outpaced the horse, was easily caught, and tried to hide in a bush, out of which it was put and speared easily.

Family VIVERRIDÆ.

The second family of the Æluroidea contains the civets, paradoxures or tree-civets, ichneumons or mangooses, and their allies, a much more diversified assemblage than the *Felidæ*. In the *Viverridæ* the head and body are more elongate, the muzzle more produced, the limbs shorter in proportion, and the teeth of the molar series more numerous than in the cats. All Indian forms have four premolars on each side above and below, one or two true molars, five toes to each foot, and a long tail. The claws vary in retractility, and so does the extent to which the tarsus and metacarpus are clad with hair beneath, this again depending upon the circumstance that some types, like *Viverra* and *Prionodon*, are truly digitigrade, whilst others, as *Arctictis* and *Paradoxurus*, are more or less plantigrade. Many of the genera have peculiar anal and preanal glands, the secretion from which is highly odoriferous.

The auditory bulla is externally constricted and internally divided by a septum, which is conspicuous from the meatus. An alisphenoid canal is present, except in *Viverricula*.

Further details of the anatomy will be found in Prof. Mivart's papers already quoted (P. Z. S. 1882, pp. 145, 459).

No representatives of this family exist in America or Australia, all being confined to the warmer parts of the Old World, and chiefly to Africa, Madagascar, and South-eastern Asia, one species extending into Spain.

The *Viverridæ* are variously divided by different authors. In the system here followed they comprise three subfamilies, one of which, *Cryptoproctinæ*, by some considered a distinct family, consists of a single species peculiar to Madagascar. The other two are represented in India, and are thus distinguished:—

A. Claws strongly curved and more or less retractile. Auditory bulla oval or subconical, broad and truncated behind, narrow in front. Apex of paroccipital process in general projecting slightly beyond the bulla; prescrotal glands generally present . . . . *Viverrinæ*.

B. Claws lengthened, exserted, not retractile. Auditory bulla somewhat pear-shaped. Paroccipital process not projecting beyond bulla, but spread out, and in adults lost on its posterior surface. No prescrotal glands. . . . . *Herpestinæ*.

Subfamily VIVERRINÆ.

African and Oriental forms both occur in this subfamily, but the latter are more numerous. The following genera are found within our area :—

A. Ears not tufted; tail not prehensile.
  a. Tarsus and metatarsus hairy behind; tail with dark and light rings.
    a'. Two upper true molars; a black gorget.
      a''. An erectile black dorsal crest .... VIVERRA.
      b''. No crest .... VIVERRICULA.
    b'. One upper true molar; no gorget .... PRIONODON.
  b. Tarsus half naked behind; tail (in Indian species) not ringed.
    a'. Teeth large; a naked preanal (in males prescrotal) glandular tract .... PARADOXURUS.
    b'. Teeth small; no naked preanal or prescrotal tract .... ARCTOGALE.
B. Ears tufted; tail prehensile; tarsus naked behind ARCTICTIS.

Genus VIVERRA, Linn., 1766.

A crest of elongate and erectile black hairs along the middle of the back. Feet truly digitigrade, the metatarsus, metacarpus, and feet being hairy throughout, with the exception of a central and five toepads on all feet and a metacarpal pad on each fore limb.

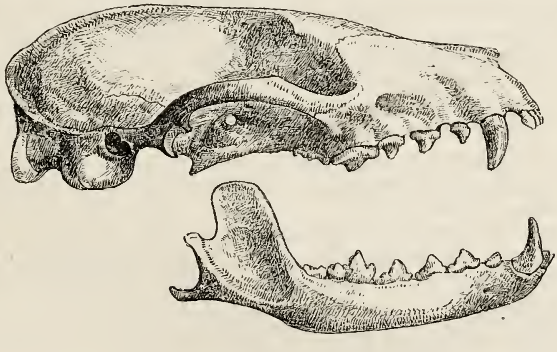

Fig. 22.—Skull of *Viverra zibetha.*

Claws small, partially retractile, and blunt. Pupil vertical. Female with three pairs of ventral teats. Fur coarse. One or more black bands across the throat; tail ringed. All the species are larger than a domestic cat. None are known to be arboreal in their habits.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{2-2}{2-2}$. The teeth are strong and the hinder teeth in the molar series broad; the inner lobe of

the upper sectorial very large, nearly equal to the hinder lobe in size. The true upper molars are well developed. The lower sectorial has a large talon with two large inner and two small outer tubercles. The milk-dentition is figured by Mivart (P. Z. S. 1882, p. 155).

Vertebræ: C. 7, D. 13, L. 7 (or D. 14, L. 6), S. 3, C. 22–30.

This and the next genus comprise the true Civet-cats, from which the substance known as civet, largely used as a perfume, is obtained. It is the secretion of a pair of glands found in both sexes, just in front of the scrotum in the male, and in a corresponding position in the female. The secretion escapes by a number of minute orifices into a large sac, the external opening of which appears as a longitudinal slit, resembling a large vaginal aperture *. There are also two glands surrounding the anus, the secretion from which has a very different and extremely offensive odour. Various kinds of civet-cats, belonging to this and the next genus, are kept in small cages in some countries, and the civet collected from the pouch periodically; but I am not aware whether this is done anywhere in India.

Synopsis of Indian and Burmese Species.

A. No black stripe down the tail.
  a. Markings on sides indistinct or wanting...... *V. zibetha*, p. 96.
  b. Large transverse dark marks on sides ...... *V. civettina*, p. 98.
B. A black stripe down upper surface of tail.
  a. Large dark tail-rings not interrupted below.. *V. megaspila*, p. 99.

Remains of two species of *Viverra*, *V. bakeri* and *V. durandi*, the last-named larger than any existing civet-cat, have been found in the Pliocene beds of the Siwalik hills.

45. **Viverra zibetha** †. *The large Indian Civet.*

Viverra zibetha, *L. Syst. Nat.* i, p. 65 (1766); *Schreb. Säugeth.* iii, p. 420, pl. cxii; *Blyth, J. A. S. B.* xxxi, p. 331; *id. Cat.* p. 45; *Jerdon, Mam.* p. 120.
Viverra undulata, *Gray, Spic. Zool.* p. 9, pl. 8.
Viverra sp., *M'Clelland, Calc. Journ. N. H.* i. p. 56, pl. i.
Viverra orientalis, *hodie* melanurus, *Hodgson, Calc. Journ. N. H.* ii, p. 47.
Viverra melanurus *et* civettoides, *Hodgson, J. A. S. B.* x, p. 909, xi, p. 279 (no descriptions).

Khatás, Hindi (used for several other animals also); *Mach-bhondar*, *Bágdos*, *Pudo-gaula*, Beng.; *Bhrán*, Nepal Terai; *Nit biralu*, Nepal; *Kung*, Bhot; *Saphiong*, Lepcha; *Kyoung-myeng* (horse-cat), Burmese; *Tangalong*, Malay.

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* Hodgson, Calc. Journ. N. H. ii, p. 54, pl. i, f. 1, 2; Mivart, P. Z. S. 1882, p. 147.

† The figures representing this species and *V. megaspila* in Sterndale's 'Natural History of the Mammalia of India' are apparently taken from other animals. The first figure much resembles the African *V. civetta*.

Ears small, rounded. Tail thick, scarcely tapering, more than half as long as the head and body. A crest of longer black erectile

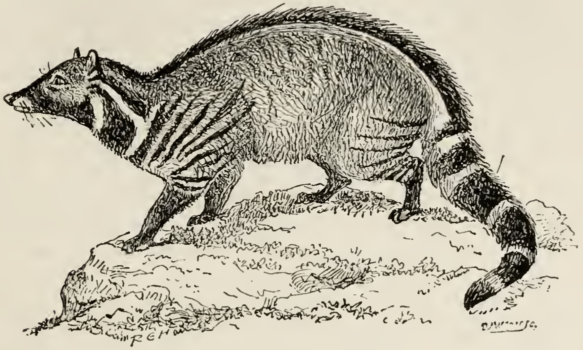

Fig. 23.—*Viverra zibetha.* (From Hodgson's drawings.)

hairs along the back from shoulders to insertion of tail. The scent-glands, when dissected out, are each 2·5 inches long by 1·5 broad.

In the skull the bony palate is continued about a quarter to half an inch behind a line joining the last upper molars, the termination being concave. Nasals short. Mandible convex below. Last upper molar one and a half times as broad as long, but last lower molar much longer than broad.

Colour. General coloration dark hoary grey, with often a brownish or yellowish tinge. Underfur brown; terminal portion of the longer hairs white with black tips on the upper part of the body. A black stripe, corresponding to the erectile crest, from between the shoulders to the first dark tail-ring, but not down the tail, which is completely surrounded by six broad black rings, the last terminal, all much broader than the white rings between them. A pale band borders the black dorsal line on each side, especially towards the rump. Sides of the body generally without markings; sometimes, however, indistinct spots and imperfect ocelli occur, forming wavy transverse bands on the sides, and longitudinal bands separated by narrow whitish lines on the loins. Legs indistinctly barred outside near the body, all the distal portions and the feet dark brown or black. Head grey; chin brown; a dark spot behind the ear; hind neck much mixed with black; front and sides of neck and upper breast white, crossed by a broad black gorget, and generally, but not always, by a narrower band in front and another behind; the hindmost meets a horizontal band running back from behind the ear along the side of the neck.

In a half-grown British-Museum specimen from Nepal the black dorsal band appears to extend in front of the shoulders. The coloration otherwise resembles that of the adult.

Dimensions. Head and body in an adult male 32 inches, tail 18, ears 2, height about 15; weight 18 to 25 lbs. A skull measures 5·25 inches in basal length, 2·7 in zygomatic breadth.

Distribution. Bengal, Assam, Burma, the Malay Peninsula, Siam, and Southern China. The range extends south and south-west of Bengal to Orissa and Chutia Nagpur, and probably some distance further south and west, and to the northward into Sikhim and Nepal, ascending the Himalayas to a considerable elevation.

Habits. The civet-cat is generally solitary. It hides in woods, bushes, or thick grass during the day, wandering into open country and often coming about houses at night. Not unfrequently it is found in holes, but whether these are dug by it is doubtful. It is said to be very destructive, killing any birds or small mammals it can capture, and often attacking fowls, ducks, &c., but also feeding on snakes, frogs, insects, eggs, and on fruits and some roots. Hodgson found in the stomachs of those he examined remains of fowls (evidently taken from a refuse-heap near a kitchen), rats, shrews, and frogs. Civet-cats take readily to water.

V. zibetha breeds in May or June, and has three or four young, which, according to Hodgson, are probably born with the eyes open. The period of gestation is not known. Hounds and all dogs are said to be greatly excited by the scent of this civet, and will leave that of any other animal for it.

Hodgson's species *V. melanura* was the uniformly coloured variety, *V. civettoides* that with transverse bars. In his drawings is the figure of a third form, said to have been brought from Tibet, covered on the body with small ocelli. I have a somewhat similar specimen, perhaps Tibetan, but less ocellated; it is probably the form said to be brought from the Chinese border of Tibet and called Kung by Tibetans (J. A. S. B. xxiv, p. 237).

46. Viverra civettina. *The Malabar Civet-Cat.*

Viverra civettina, *Blyth, J. A. S. B.* xxxi, p. 332 (1862); *id. P. Z. S.* 1864, p. 484; *id. Cat.* p. 44; *Jerdon, Mam.* p. 121.

"Dusky grey, with large transverse dark marks on back and sides; two obliquely transverse dark lines on the neck, which, with the throat, is white; a dark mark on the cheek; tail ringed with dark bands; feet dark. Size of the last (*V. zibetha*) or nearly so." (*Jerdon.*)

I have been unable to examine a specimen of this civet; but Mr. W. L. Sclater, who has recently compared the type with *V. zibetha*, writes to me that *V. civettina* is distinguished by having the hinder parts of the body covered with distinct large spots, and by the black rings of the tail being united by a black band above. This quite bears out Blyth's description. The large upper true molar in *V. civettina* is more quadrangular, 0·36 inch long by 0·4 broad, in *V. zibetha* 0·32 by 0·4; and in the lower jaw of the former the

first and second premolars are close together, in the latter widely separated.

The area inhabited by *V. civettina* is separated from that occupied by *V. zibetha* by a broad tract of country, there being no civet known to occur in the Central Provinces, Deccan, or Carnatic. It is therefore probable that *V. civettina* is a distinct species. The following account of its distribution is from Jerdon:—

"The Malabar civet-cat is found throughout the Malabar coast, from the latitude of Honore (Honawar) at all events to Cape Comorin, and very possibly it extends further north. It inhabits the forests and the richly wooded low land chiefly, but is occasionally found on the elevated forest-tracts of Wynaad, Coorg, &c. It is very abundant in Travancore, whence I have had many specimens. It is not recorded from Ceylon, but most probably will be found there. I have procured it close to my own house at Tellicherry, and seen specimens from the vicinity of Honore. I never obtained it from the Eastern Ghâts nor from Central India. It is stated by the natives to be very destructive to poultry."

47. Viverra megaspila. *The Burmese Civet.*

Viverra megaspila, *Blyth, J. A. S. B.* xxxi, p. 331 (1862); *id. P. Z. S.* 1864, p. 484; *Günther, P. Z. S.* 1876, p. 428, pl. xxxvii.
Viverra tangalunga, *Cantor, J. A. S. B.* xv, p. 197, *nec Gray.*

Kyoung-myeng, Burm.; *Músang-jebat,* Malay.

Tail less than half the length of the head and body, tapering. A band of erectile black hairs along the back, sometimes but not always less developed than in *V. zibetha.*

Bony palate extending nearly half an inch behind a line joining the last upper molars; termination very concave. The teeth larger and broader than in *V. zibetha*; hinder upper molar oval, not much broader than long; hinder lower molar very little longer than broad, and larger than that in *V. zibetha.*

Colour. Grey, sometimes with a yellowish or brownish tinge (the figure in P. Z. S. is too brown), scarcely paler below; underfur pale brown to whitish, the tips of the longer hairs grey or black. A black line down the back from the shoulders continued down the tail, which is ringed with dark brown or black; the proximal rings about the same breadth as the whitish interspaces, and (except sometimes the first) extending round the tail. Terminal portion of tail for a varying distance (sometimes half the length) black. Sides with spots, usually distinct, larger than in *V. zibetha* or *V. tangalunga* (about three quarters of an inch in diameter), tending to form transverse bands on the sides and longitudinal on the rump. Feet brown. Head grey; base of ear behind a little darker; hind neck dusky; chin brown; neck white in front and on sides, with two or three black gorgets, the anterior just behind the brown chin often wanting, the second well marked

across the throat, the third faint on the upper breast, but distinct on the side of the neck, where it runs forward to behind the ear.

Dimensions. A large individual measured 37 inches from nose to the root of the tail; tail 17·5 inches. Basal length of skull about 5·2 inches, zygomatic breadth 2·9.

Distribution. Burma, Malay Peninsula, Cochin China, and Sumatra. Recorded as far north as Prome.

Habits. Similar to those of *V. zibetha*. This civet is said by Cantor to have from one to three young at a time.

Viverra tangalunga, Gray, inhabits Java, Sumatra, Borneo, the Philippines, and, it is said, Malacca, but this requires confirmation. The only other species of the genus is the African *V. civetta*.

Genus **VIVERRICULA**, Hodgson (1838).

No erectile mane along the back; nails sharper and more curved than in *Viverra*; pollex and hallux shorter and more remote from the other toes. Foot and toepads precisely as in *Viverra*. The build is slighter, the size much smaller, the muzzle finer, and the whole animal more adapted for arboreal and climbing habits. The anal and prescrotal glands are similar.

In the skull there is, as a rule, no alisphenoid canal, although one is very rarely present. The anterior portion of the bulla in front of the constriction is much more swollen than in *Viverra*, so that the bulla looks considerably longer; the paroccipital process, too, seldom projects at all from the hinder part of the bulla, being generally rounded off against it. The teeth are small, compressed, and sharp, the formula being the same as in *Viverra*.

Vertebræ: C. 7, D. 13, L. 7, S. 3, C. 25.

The absence of an erectile mane, and the differences in the skull and structure of the feet, appear to justify the separation of the present genus, which resembles *Viverra* in its other characters. There is but a single species.

48. **Viverricula malaccensis.** *The small Indian Civet.*

Viverra malaccensis, *Gmel. Syst. Nat.* i, p. 92 (1788); *Jerd. Mam.* p. 122.
Viverra indica, *Geoffr., Desm. Nouv. Dict.* vii, p. 170 (1817); *Elliot, Mad. Journ. L. S.* x, p. 102.
Viverra bengalensis *and* V. pallida, *Gray, Hardwicke's Ill. Ind. Zool.* i, pl. 4; ii, pl. 6.
Viverra rasse, *Horsf. Res. Java*, pl.
Viverricula indica *and* V. rasse, *Hodgson, A. M. N. H.* i, p. 152 (1838).
Viverricula malaccensis, *Blyth, Cat.* p. 45; *Anderson, Zool. An. Res.* p. 166; *Thomas, P. Z. S.* 1886, p. 55.

Mashk-billa, Katás, H.; *Gandha gokal, Gando gaula*, B.; *Sogot*, Ho Kol; *Jowádi manjúr*, Mahr.; *Saiyar, Bag-myúl*, Nepal Terai; *Púnagin bek*, Can.; *Púnagú pilli*, Tel.; *Uralawa*, Cing. This animal is also called

Kasturi, a name properly belonging to the musk-deer, in parts of India. *Koung-ka-do,* Burmese; *Wa-young-kyoung-byouk,* Arakan.

Tail tapering, about two thirds to three quarters the length of the head and body. Ears short and rounded. Fur harsh and rather coarse. Teats 6, ventral. Pupil vertical.

In the skull the nasals are of moderate length, terminating posteriorly in front of a vertical plane passing through the anterior extremities of the orbits; the occipital crest is greatly developed. Bony palate extending back some distance behind the posterior molars. Mandible convex below.

Colour. Brownish grey to pale yellowish brown, with usually several longitudinal black or brown bands on the back and longitudinal rows of spots on the sides. In some specimens both lines and spots are indistinct, and the dorsal bands are occasionally wanting; but usually there are five or six distinct bands on the back and four or five rows of spots on each side. Neck-markings rather variable; generally there are two dark stripes from behind the ear to the shoulders, and often a third in front, crossing the throat. A dusky mark behind each ear and one in front of each eye. The head grey or brownish grey; chin often brown. Feet brown or black. Tail with alternating black and whitish rings, seven to nine of each colour. The underfur brown or grey (often grey on the upper parts of the body and brown on the lower); coarser hairs with long grey, brown, or black terminations, the grey hairs on the upper parts often tipped with black.

Dimensions. Head and body 21 to 23 inches, tail (including the hair at the end, which is about an inch long) 15 to 17, ear 1 to $1\frac{1}{2}$ long outside, height about 9; weight 5 to 6 lbs. A male skull measures 3·75 inches in basal length, 1·75 in zygomatic breadth; another 4 by 1·8.

Distribution. Throughout India, except in Sind, the Punjab, and the western parts of Rájputána. A specimen was obtained by Mr. Adam at Sámbhar. Also found in Ceylon, Assam, Burma, Southern China, the Malay Peninsula, Java, and some of the other Malay islands. This species likewise inhabits Socotra, the Comoro Islands, and Madagascar, but has probably been introduced, having been carried thither caged as a producer of civet.

Habits. The small civet inhabits holes in the ground, or under rocks, or thick bush, but appears not to have been observed in forest, although it is said to climb well and to be distinctly arboreal in its habits. It comes near human habitations, and has been met with taking refuge in drains and outhouses. It is frequently kept in confinement, and becomes perfectly tame. Jerdon states that he kept several, which caught rats, squirrels, and birds, and he adds that this species is kept by natives for the purpose of yielding civet. The food is varied, chiefly consisting of small animals, vertebrate and invertebrate, but partly of fruits and roots. Poultry are occasionally carried off by this civet. The female has usually four or five young at a birth.

Genus **PRIONODON**, Horsfield, 1823.

Syn. *Linsang*, Müller, 1839.

No dorsal mane. Form slender; limbs short; head and neck long; ears short, rounded; muzzle pointed; tail very long, cylindrical. Claws perfectly retractile and sharp; thumb and hallux near the other digits. There is on the inner proximal side a supplementary lobe to the central palmar and plantar pads, separated

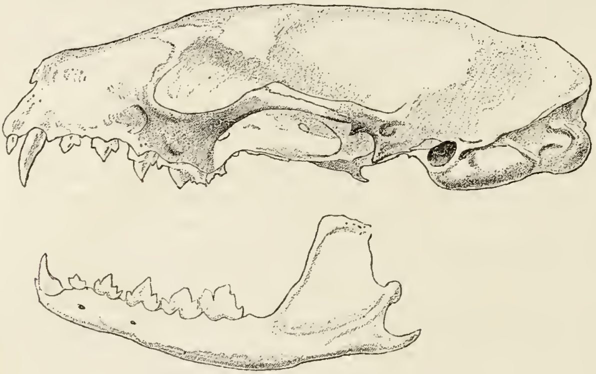

Fig. 24.—Skull of *Prionodon maculosus.*

from the other three lobes by hair in *P. pardicolor*, but not in the other species. Metatarsus and metacarpus hairy beneath. No prescrotal glands. Anal glands present. Fur soft. Female with four teats—two ventral anteriorly situated, and two inguinal. Colour fulvous, with bold black spots or markings. Tail ringed.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{1-1}{2-2}$; the posterior upper molar of *Viverra* wanting. The teeth are sharp and compressed.

Of this genus two species are found within our area, a third is Malay. All appear to be carnivorous; they may also, as suggested by Hodgson, live partly upon insects. An allied genus, *Poiana*, is the representative of *Prionodon* in Africa.

Synopsis of Indian and Burmese Species.

A. Smaller; head and body about 15 inches; skull $2\frac{1}{2}$ to $2\frac{3}{4}$; back with longitudinal rows of large spots .... *P. pardicolor*, p. 103.

B. Larger; head and body 18 to 20 inches, skull 3; back with broad transverse bands .... *P. maculosus*, p. 104.

49. **Prionodon pardicolor.** *The spotted Tiger-Civet.*

Prionodon pardicolor, *Hodgson, Calc. Journ. N. H.* ii, p. 57, pl. i, figs. 3, 6 (1842); viii, p. 40, pl. i; *Blyth, Cat.* p. 46; *Jerdon, Mam.* p. 124; *Anderson, An. Zool Res.* p. 166.

Zik-chúm, Bhot.; *Súliyú,* Lepcha.

Fig. 25.—*Prionodon pardicolor.* (From Hodgson's drawings.)

Tail as long as the body and neck. Pupil round.

Skull with the zygomatic arch slight. The constriction of the bulla is very marked.

Colour. Fulvous (very pale brown), with large black spots above, whitish and unspotted below. Underfur slaty, tips of longer hairs buff or black. Head brown; frequently a black spot behind each ear. Four bands down neck, two on each side, two broader above from behind ears to between shoulders, the others lower down and more broken into spots; the two upper bands are continued as rows of large rounded spots down the back, a row of smaller irregular spots intervening, and about three more rows of spots, square or round, diminishing in size below, down each side. The spots also form about six or seven transverse rows. Limbs near the body spotted outside; feet pale brown, unspotted. Tail with about eight to ten dark rings separated from each other by the same number of pale rings, all passing right round the tail and subequal in breadth.

Dimensions. Head and body 14 to 15 inches, tail 12 to 13, height 5 to $5\frac{1}{2}$; weight about a pound. Skull 2·5 inches long, 1·25 broad.

Distribution. The south-eastern Himalayas, extending thence

eastward to Yunan, where it was obtained by Anderson. It is not rare in the interior of Sikhim, probably at moderate elevations.

Habits. According to Hodgson, who had one example tame, this very beautiful and graceful little animal is "equally at home on trees and on the ground; it dwells and breeds in the hollows of decayed trees. It is not gregarious at all, and preys chiefly on small birds, which it is wont to pounce upon from the cover of the grass. The times of breeding are said to be February and August, and the litter to consist of two young, there being two litters each year."

The tame specimen (a female) was "wonderfully docile and tractable, very sensitive to cold and very fond of being petted." It was fed on raw meat, and refused fish, eggs, and fruits. It never uttered any sound. The animal was perfectly free from any odour.

50. **Prionodon maculosus.** *The Burmese Tiger-Civet.*

Prionodon maculosus, *W. Blanf. P. A. S. B.* 1878, p. 71; *J. A. S. B.* xlvii, pt. 2, p. 152, pls. vi, vii (1878); *Thomas, P. Z. S.* 1886, p. 66.

Tail a little shorter than the head and body, cylindrical. Skull larger and more strongly built than that of the other species, but the anterior portion of the bulla is much less swollen than in *P. pardicolor.* The pterygoid fossæ are very broad.

Colour. Grey, with about six broad rather irregular transverse brownish-black bands across the back, much broader than the intervening pale stripes (or the back may be described as brownish black with six narrow pale bars across). The dark bands are broken up on the sides of the body, forming interrupted longitudinal dark stripes, one of which is conspicuous and runs across the shoulder to the side of the neck, and is continued by spots beneath the ear to the eye. A broader dark band down the upper part of the neck on each side from a little behind the ear to behind the shoulder, where it passes into the transverse bands; between the two upper neck-bands are a few spots, as also on the fore neck, forming an imperfect gorget, and on the outside of the limbs. Lower parts and feet pale, unspotted. Nose dark brown mixed with grey; head generally brownish grey, dark around the orbits and in front of them; and two dark streaks running back from the eye, one to the crown, the other to join the lower neck-band. Ears dark behind. Tail with seven perfect blackish rings alternating with pale interspaces, which are much narrower. Underfur ashy grey.

Dimensions. Head and body about 19 inches, tail 16 (without the hair at the end, which is less than an inch long), height at shoulder about 6, length of tarsus and hind foot 2·8, ear outside 0·65. Basal length of skull 2·9, zygomatic breadth 1·5.

Distribution. Tenasserim Provinces. One specimen was procured

by Mr. Limborg east of Moulmein, a second by Mr. W. Davison at Bánkasún in Southern Tenasserim.

Habits. Unknown; probably similar to those of *P. pardicolor.*

The only other species of the genus is that first described, *P. gracilis*, a small form with nearly the coloration of *P. maculosus*, but a very different skull. This kind inhabits Java, Borneo, and, it is said, Sumatra. It was also reported from Malacca by Cantor (J. A. S. B. xv, p. 199); but, judging by the dimensions given, it is not improbable that the species obtained by him was *P. maculosus.*

Genus **PARADOXURUS**, F. Cuv., 1821.

Syn. *Paguma,* Gray; *Platyschista,* Otto.

No mane. The naked soles of the feet are joined to the foot-pads (no hairy space intervening), and extend over considerably more than half the inferior surface of the carpus and tarsus. Claws small, sharp, retractile. Pupil vertical. Tail very long, not ringed in Indian species.

All the species are nocturnal and arboreal. The food is mixed, partly animal, partly vegetable. Prescrotal and anal glands as in *Viverra*, except that the former discharge into a slight fold instead of a deep pouch, and that their secretion has little or no scent of civet. There is a well-marked tract devoid of hair, corresponding to the glands, in front of the scrotum in the male and around the genito-urinary orifice in the female. The secretion from the anal glands is in some forms singularly fetid *.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{2-2}{2-2}$; as in *Viverra.* The teeth vary much in development and somewhat in form, being large in some species and small in others. The bony palate extends back above the posterior nares in a few kinds only. The pterygoid fossa is broad.

Vertebræ: C. 7, D. 13, L. 7, S. 3, C. 29–36.

The tail is not prehensile, but the animal appears to have the power of coiling it to some extent, and in caged specimens the coiled condition not unfrequently becomes confirmed and permanent. The name *Paradoxurus* was given by F. Cuvier to a specimen with the tail thus coiled, as represented in the 'Histoire Naturelle des Mammifères,' pl. 186. Nothing of the kind, so far as I am aware, has been observed in wild examples, nor has any use of the tail for prehensile purposes been recorded. At the same time it should not be forgotten that, owing to the exclusively nocturnal habits of *Paradoxuri*, they are seldom seen in the wild state.

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* For a description of the glands see Hodgson, As. Res. xix, p. 77; Turner, P. Z. S. 1849, p. 25; also Mivart, P. Z. S. 1882, pp. 163, 519. There is also an excellent account, with figures, by Otto, Acad. Cæs. Leop. Nova Acta, xvii, p. 1095, pl. lxxiii.

I have described the history and synonymy of this genus in the 'Proceedings of the Zoological Society' for 1885, pp. 780–808.

Synopsis of Indian, Ceylonese, and Burmese Species.

A. Bony palate not extending a quarter of an inch behind the last upper molars.
- a. Vibrissæ black, a few of the lowest sometimes white near the base only; dorsal fur often long and ragged, with long black tips.
  - *a.* Back unstriped; no pale band across forehead .... *P. niger*, p. 106.
  - *b.* Back generally striped; a pale band across forehead .... *P. hermaphroditus*, p. 108.
- b. Vibrissæ dark brown; general colour the same............................. *P. jerdoni*, p. 111.
- c. Vibrissæ rufous; general colour dull rusty red .... *P. aureus*, p. 110.

B. Bony palate extending more than half an inch behind the last upper molars; vibrissæ white .... *P. grayi*, p. 112.

51. **Paradoxurus niger.** *The Indian Palm-Civet.*

Viverra nigra, *Desm. Mam.* p. 208 (1820).
Viverra bondar, *De Blainv. ibid.* p. 210 (1820).
Paradoxurus typus, *F. Cuv. Hist. Nat. Mamm.* pl. 186 (1821); *Elliot, Mad. Jour. L. S.* x, p. 103; *Kelaart, Prod.* p. 38 (1852).
Paradoxurus typus, P. pennantii, *and* P. bondar, *Gray, P. Z. S.* 1832, pp. 65, 66.
Platyschista pallasii, *Otto, Acad. Cæs. Leop. Nova Acta*, xvii, p. 1089, pls. lxxii, lxxiii (1835).
Paradoxurus hirsutus, *Hodgs. As. Res.* xix, p. 72 (1836).
Paradoxurus hermaphroditus, *Gray, P. Z. S.* 1864, p. 532 (*nec* Viverra hermaphrodita, *Pallas*).
Paradoxurus musanga, *partim, et* P. bondar, *Jerdon, Mam.* pp. 125, 128.
Paradoxurus niger, *W. Blanf. P. Z. S.* 1885, p. 792; *Thomas, P. Z. S.* 1886, p. 55.

Lakáti, *Chingár* (vulgarly *Khatás* and *Jhár-ka-Kutta*), H.; *Menuri*, Dakhani; *Bhám*, *Bhondar*, Bengali; *Machabba*, *Malwa*, Nepal Terai; *Togot*, in Singhbhúm; *Ud*, Mahr.; *Kera-bek*, Canarese; *Maru-pilli*, *Veruvú*, Tam.; *Manu-pilli*, Tel.; *Marrapilli*, Mal.; *Ugudora*, Cing.; *Toddy Cat* of Europeans in many parts.

Tail nearly or quite as long as the head and body, well clad with hair, slender, tapering very slightly. Fur coarse and often long, some piles, especially on the back, long and ragged; underfur short or wanting. Ventral mammæ usually six (sometimes four, according to Hodgson).

In the skull the bony palate extends but little, not more usually than about one eighth of an inch, behind a line drawn through the hinder edges of the posterior molars. Muzzle produced and

narrow, but varying in length. Upper sectorial tooth narrow, the inner lobe small and at the distal extremity of the tooth; the

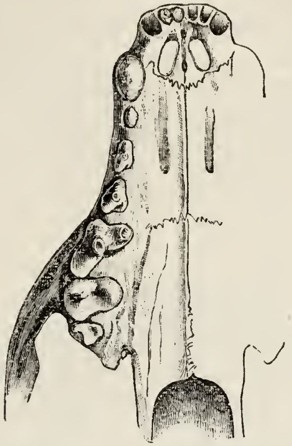

Fig. 26.—Half palate of *Paradoxurus niger*. (P. Z. S. 1885, p. 793.)

inner margin of the tooth between the inner and hinder lobe distinctly concave.

Colour. Blackish grey to brownish grey. The fur in general long, and with long ragged coarse black tips; but these are, of course, much more developed in the cold season. Underfur, when present, ashy or brownish; the longer hairs, beyond the underfur, pale grey with long black tips. As a rule there are no stripes on the back, but indistinct dark bands and rows of spots are sometimes seen, especially in young specimens. Feet and the greater part of the legs, with the terminal portion (frequently more than half) of the tail, black. The tip of the tail is sometimes white, and individuals with the feet or other parts of the body white are occasionally found. Head-markings variable; face generally black or blackish, with a distinct white or grey spot below the eye, another (generally) on each side of the nose amongst the vibrissæ, and often another above the eye. There is not, however, in this species, as usually there is in the next, a distinct whitish band across the forehead. Vibrissæ black; occasionally, but rarely, a few of the lower are whitish or white towards the base.

Dimensions. Males are larger than females. A male measured: head and body 22·5 inches, tail 19·5; a female 20 and 17·5. In another female both were about 18 inches long. An adult female skull measures 3·9 inches in basal length, 2·3 broad; a male 4·15 by 2·35; another, very large (from Nepal), 4·4 by 2·55.

Distribution. Throughout the peninsula of India, from the foot of the Himalayas, and Ceylon, wherever there are trees; equally common in the wildest forest and about human habitations. It is

not found in the Punjab and Sind, and is rare in the bare parts of the North-west Provinces and the Bombay Deccan. Common in Upper Bengal, Southern India, and the West coast.

Varieties. Southern Indian and Ceylonese skins are blacker than those from Northern India; but I can find no other distinction between the typical *P. niger* (*P. typus* of many writers) and the form usually known as *P. bondar*, which is not nearly so yellow as Hodgson's description would lead a reader to suppose. Jerdon's description is manifestly taken from Hodgson's, and neither Blyth nor Jerdon had seen Hodgson's specimens. The *Viverra bondar* of De Blainville was founded on a drawing in Buchanan Hamilton's collection, preserved in the India Office Library. This drawing certainly represents, I think, the common Indian palm-civet.

Habits. The common palm-civet, tree-cat, or toddy-cat, is a familiar animal in most parts of India, though, being thoroughly nocturnal in its habits, it is but rarely seen in the daytime. It is arboreal, passing the day generally in trees, either coiled up in the branches, or in a hole in the trunk, and in places where cocoa-nut palms are common it frequently selects one of them for a residence. Mango-groves are also a favourite resort. It not unfrequently takes up its abode in the thatched roofs of houses; Jerdon found a large colony established amongst the rafters of his own house in Tellicherry. It is also found in dry drains and out-houses. It even occurs in large towns; I have known of one being caught in the middle of Calcutta. It is common in forest, and its presence may be detected, as Tickell observes in his MS. notes, by its droppings, rather smaller than a cat's, and always deposited on the top of the trunks of large fallen or felled trees.

The food of *P. niger* consists partly of small mammals, lizards, and snakes, birds and their eggs, and insects; partly of fruit and vegetables. This animal at times is very destructive to poultry; it is also said to do mischief in vegetable gardens. Throughout Southern India and Ceylon it is said to have an especial fondness for palm-juice or toddy, whence its popular name of toddy-cat. In confinement it will eat cooked food of almost any kind, boiled rice, vegetables, &c.

The palm-civet breeds in holes of trees, and has from four to six young. When taken young this animal is easily tamed.

52. **Paradoxurus hermaphroditus.** *The Malayan Palm-Civet.*

Viverra hermaphrodita, *Pallas, Schreber, Säugeth.* iii, p. 426 (1778).
Viverra musanga, *Raffles, Trans. Linn. Soc.* xiii, p. 252 (1822).
Paradoxurus prehensilis, P. musanga, P. dubius, P. hermaphroditus, P. pallasii, P. crossii, *and* P. finlaysonii, *Gray, P. Z. S.* 1832, pp. 65–68.
Paradoxurus quinquelineatus *and* P. musangoides, *Gray, Charlesworth's Mag. N. H.* i, p. 579 (1837).
Paradoxurus hirsutus, *Hodgs. As. Res.* xix, p. 72 (1836).
Paradoxurus nigrifrons, *Gray, List Sp. Mamm. B. M.* p. 55 (1843), no description; *id. P. Z. S.* 1864, p. 535.

Paradoxurus strictus *and* P. quadriscriptus, *Hodgs. A. M. N. H.* ser. 2, xvi, pp. 105, 106; *id. P.Z. S.* 1856, p. 396, pls. xlvii, xlviii.
Paradoxurus fasciatus, *Gray, P. Z. S.* 1864, p. 536, *nec* Viverra fasciata, *Desm.*
Paradoxurus musanga, *Jerdon, Mam.* p. 125, *partim*; *Blyth, Mam. Birds Burma*, p. 26.
Paradoxurus hermaphroditus, *W. Blanf. P. Z. S.* 1885, p. 794; *Thomas, P. Z. S.* 1886, p. 67.

Bhondar, *Bághdánkh*, Beng.; *Kyoung-won-baik*, *Kyoung-na-ga*, Burm.; *Khabbo-palaing*, Talain; *Sapo-mi-aing*, Karen: *Músang*, or *Músang Pándan*, Malay.

Fig. 27.—*Paradoxurus hermaphroditus.* (From a drawing by Colonel Tickell; position slightly altered.)

Structure generally much as in the last. Tail more than three quarters the length of the head and body. Fur as a rule not so long and ragged as in *P. niger*. Muzzle shorter; upper sectorial and molars larger, the former with a large inner lobe, and with the margin from the inner to the hinder lobe nearly or quite straight.

Colour. Brownish grey, sometimes ashy. Underfur, when present, brownish, the longer hairs light brown or grey, occasionally with black tips. The back is generally more or less distinctly striped longitudinally, most distinctly when the fur is short, the number of stripes varying and the lateral bands often replaced by rows of spots. Feet and terminal portion of tail (often one half or more) black; tail-tip sometimes white. Usually there is a distinct broad pale or whitish band across the forehead and in front of the ears, and as a rule this band is not crossed by black streaks, but sometimes there is a longitudinal black line in the middle and another running back from each eye. Generally a white or whitish spot occurs below the eye, and this spot sometimes is joined to the frontal band. The muzzle, including the eyes, the top of the head, with the ears and sides of the neck, are

black or dark brown. The markings, however, are very variable, and occasionally either the dorsal striping or the pale frontal band is wanting; but as a rule one or the other is distinct, and serves to distinguish this from the last species. Vibrissæ black, the lowest occasionally white near the base.

Dimensions. About the same as in *P. niger.* Head and body 20 to 25 inches, tail 16 to 20. A male skull from Burma measures 3·8 inches in basal length; 2·45 in zygomatic breadth.

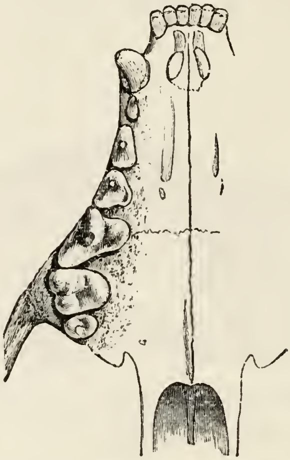

Fig. 28.—Half palate of *Paradoxurus hermaphroditus.* (P. Z. S. 1885, p. 796.)

Distribution. Throughout the countries east of the Bay of Bengal —Burma, Siam, Malay Peninsula, Sumatra, Java, and Borneo. In Lower Bengal and at the base of the Himalayas, in Sikhim and in Assam, many of the *Paradoxuri* appear to belong to this species or to be intermediate between it and *P. niger.*

Habits. Precisely the same as those of *P. niger.*

This species has been united to the last by Blyth and Jerdon, and unquestionably the two pass into each other, so that it is a mere question of convenience whether they are called species or races. As a rule the Eastern form is distinguished both by having stripes on the back and a distinct frontal band, and by its larger and differently shaped upper sectorial teeth; and as the difference is considerable, and each form fairly constant over an immense tract of country, I think it better to use different names for the two.

53. **Paradoxurus aureus.** *The Ceylonese Palm-Civet.*

Paradoxurus aureus, *F. Cuv. Mém. Mus. Hist. Nat.* ix, p. 48, pl. 4 (1822); *W. Blanford, P. Z. S.* 1885, p. 802, pl. 1.

Paradoxurus zeylanicus, *Kelaart, Prod.* p. 39; *Gray, P. Z. S.* 1864, p. 531; *Blyth, J. A. S. B.* xx, pp. 161, 184; *id. Cat.* p. 47; *nec* Viverra zeylonensis, *Pallas, nec* V. zeylanica, *Gmelin.*

Paradoxurus montanus, *Kelaart, apud Blyth, J. A. S. B.* xx, pp. 161, 184; *id. Prod.* p. 40.

Kula-wedda, Cingalese.

Tail about four fifths the length of the head and body. Fur moderately soft and thick, of uniform length, with but little woolly underfur. Mammæ four.

Skull very similar to that of *P. hermaphroditus*; the upper sectorial tooth is larger than in the Indian form (*P. niger*), the inner lobe being very well developed. The anterior upper true molar also is broader inside, being sometimes nearly rectangular.

Colour. Uniform dull rusty red or dull chestnut, passing, however, in some specimens into a darker and browner shade. The fur and underfur are of nearly the same shade throughout; no black tips to the hairs. Faint longitudinal dorsal streaks may be detected on many specimens. A white subterminal band is occasionally found on the tail. Vibrissæ whitish in dried skins, probably rufous in fresh specimens.

Dimensions. A fully grown female, according to Kelaart, measured: head and body 19 inches, tail 15·5, height 8. Males are probably larger. A skull measures 3·85 inches in basal length, and 2·35 in zygomatic breadth.

Distribution. The island of Ceylon, apparently generally distributed, the darker specimens being from a considerable elevation.

Habits. According to Kelaart, this species is less carnivorous than *P. hermaphroditus*, specimens obtained near Newera Ellia having fed entirely on the fruit of *Physalis peruviana* or Cape gooseberry (the *Tipári* of Bengal). In other respects the habits of the two are precisely similar.

54. **Paradoxurus jerdoni.** *The brown Palm-Civet.*

Paradoxurus jerdoni, *W. Blanf. P. Z. S.* 1885, pp. 613, 802, pl. xlix; 1886, p. 420.

Kárt-nai (forest-dog), Mal.

General structure apparently as in *P. hermaphroditus*, except that the fur is of uniform length. Woolly underfur but little developed.

Skull distinguished from that of all other species by the great length of the anterior palatine foramina, which, in the only specimen examined, are over 0·4 inch long and extend back as far as the hinder edges of the anterior pair of upper premolars. Teeth larger than in ordinary specimens of *P. hermaphroditus.*

Colour. Rich deep brown on head, shoulders, and limbs, back and sides the same but grizzled. Tail brown, tip often white. Fur and underfur brown, except a long subterminal grey ring on the longer hairs of the back and sides. Vibrissæ dark brown.

Dimensions. Approximately the same as those of *P. zeylonensis.* Adult skull 4·2 inches long from occipital condyles, 2·5 wide across zygomatic arches.

Distribution. Only known with certainty from the Palni hills in Madura, and the Nilgiris, but probably inhabiting all the higher ranges of Cochin and Travancore.

Habits. Not known.

55. **Paradoxurus grayi.** *The Himalayan Palm-Civet.*

Paradoxurus grayi, *Bennett, P. Z. S.* 1835, p. 118; *Jerdon, Mam.* p. 128; *Blyth, Mam. Birds Burma,* p. 26; *W. Blanf. P. Z. S.* 1885, p. 803.
Paradoxurus nipalensis, *Hodgson, As. Res.* xix. p. 76 (1836).
Paradoxurus tytlerii, *Tytler, J. A. S. B.* xxxiii, p. 188 (1864).

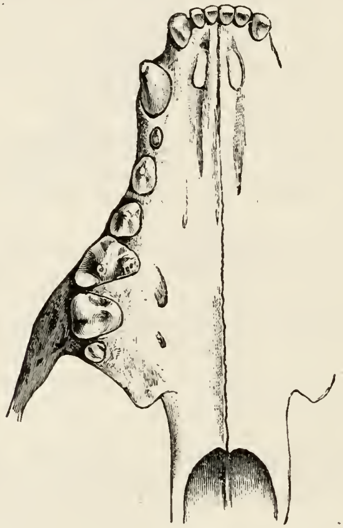

Fig. 29.—Half palate of *Paradoxurus grayi.* (P. Z. S. 1885, p. 804.)

Tail about the same length as the head and body. Fur varying in length, but much more uniform throughout the body, less harsh and more woolly than in *P. hermaphroditus*; woolly underfur frequently well developed. Mammæ 4.

In the skull the constriction behind the postorbital processes is much less than in the preceding species. The bony palate runs back above the posterior nares for 0·4 to 0·5 inch behind the hindmost molars, and is deeply concave at the end. The teeth are smaller than in *P. hermaphroditus*; the inner lobe of the upper sectorial less developed, and the first upper true molar more triangular. In old individuals the teeth, the molars especially, are much worn down.

Colour. Grey throughout, without markings on the body, the lower parts paler and whitish. Underfur brownish grey or dusky, paler towards the base, longer hairs whitish grey towards the end, the tips on the upper parts black. Frequently, though not always, the terminal half of the tail is dusky or blackish; feet usually brown. Head, including ears and chin, brown or blackish, with the exception of the forehead, a broad band beneath each ear, a narrower line down the nose, and a blotch or spot below each eye, where white hairs are conspicuously intermixed, but there is some variation in their proportion and distribution. Vibrissæ (whiskers) mostly white, some of the uppermost black.

Some specimens have a yellowish or brownish tinge, especially on the rump, thighs, and base of the tail.

Dimensions. Head and body 24 to 25 inches, tail with hair at the end about the same; weight 9 to 10 lbs. A very old skull measures 4·4 inches in basal length, 2·7 in zygomatic breadth.

Distribution. Throughout the Eastern Himalayas in Assam, Sikhim, and Nepal, and as far west as Simla, whence a specimen was obtained by Mr. Hume. Surgeon-General L. C. Stewart informs me he shot an individual near Landour, at an elevation of 7500 feet. This species also occurs in Arakan and the Andaman Islands, but not I believe in the Peninsula of India, some reported occurrences being probably due to mistaken identification.

Varieties. Some skins in the British Museum sent by Mr. Hodgson have short woolly fur, and are of a yellowish-brown colour. I believe them to be either a variety of *P. grayi* or perhaps dyed skins. The thinness and shortness of the fur show that the specimens were derived from a warm region, probably from near the base of the Himalayas. I have similar skins from Sikhim. The skull from one of Mr. Hodgson's skins is precisely similar to those of *P. grayi*.

The Andaman form *P. tytleri* is slightly smaller in size, but does not appear otherwise to differ. The head and body, according to the describer, measured 21 inches, tail 20; a stuffed skin in the British Museum is a little larger. The skull from the latter is 4·45 inches long, 2·65 broad.

Habits. We are indebted almost entirely to Mr. Hodgson's researches for a knowledge of this animal's habits. It is more frugivorous than the common palm-civet, but, like that species, feeds partly on animal, partly on vegetable food, and captures birds and small mammals. It lives and breeds in holes of trees, four young having been found on one occasion, and it inhabits mountain forests. In the Andaman Islands the smaller variety is said to do much havoc amongst pine-apples.

This species appears to be easily tamed. A tame individual kept by Hodgson was "very cleanly, and its body emitted no unpleasant smell, though, when it was irritated, it exhaled a most fetid stench, caused by the discharge of a thin yellow fluid from four pores, two of which are placed on each side of the anal aperture," the orifices, in short, of the anal glands. McMaster in his 'Notes on Jerdon,' p. 37, relates how his servants and dogs were

baffled in their endeavour to capture an animal, which he suggests may have been this species, at Russellkonda in the Northern Circars, by the singularly fetid fluid discharged by the creature. It is very possible, however, that the common palm-civet may have the same power as *P. grayi* of making itself obnoxious.

The tail was coiled, as it sometimes is in the common Indian palm-civet, in the original type of this species, a caged specimen.

Nearly allied to *P. grayi* is a still larger form, *P. leucomystax*, reddish brown in colour, with the head, except on the muzzle, paler. This is found in Malacca and the Malay Archipelago, and may possibly occur in Tenasserim *. *P. rubidus*, Blyth, J. A. S. B. xxvii, p. 275, is probably a variety of the same species.

Another form, considerably smaller than *P. grayi*, inhabits China, and was named *P. larvata* from the distinct head-markings. Both these species have the same prolonged bony palate as *P. grayi*, and all three externally resemble each other by their conspicuous white vibrissæ. By Gray they were distinguished as a genus, which he called *Paguma*.

The nature and affinities of the animal called *Paradoxurus laniger* (As. Res. xix. p. 79) by Hodgson are as obscure as its habitat. It is not quite certain that the only skin known, which is without a skull and in very indifferent condition, belongs to this genus; and it is questionable whether this specimen was obtained within the limits accepted in the present work. The following brief description may enable the form to be recognized if rediscovered. The fur consists of very thick woolly hair, without longer piles. The tail is thick at the base and tapers rapidly, it is but little more than half the length of the head and body. The soles of the feet are naked, but the toe-pads are almost surrounded by hair. There is a naked area in front of the anus. The colour is rather light rufescent brown (or greyish fawn), the hair grey at the base, light brown towards the tips, no black tips anywhere; the tail nearly the same colour throughout. The head has lost almost all its hairs. This skin was said to be from Tingri, Tibet, and evidently belonged to an animal inhabiting a cold climate (see P. Z. S. 1885, p. 807).

Genus **ARCTOGALE**, Peters, 1864.

All the teeth, except the canines, very small; those in the molar series scarcely or not in contact. The upper sectorial much rounded, the inner lobe median in position, not anterior. Palate frequently convex longitudinally between the upper sectorial teeth, the posterior portion sloping upward, and greatly produced above the posterior nares, the sides of which are arched towards each other; mesopterygoid fossa excessively narrow, less than half the breadth of the palate between the upper sectorial teeth. No pterygoid fossa.

* There was in 1877 a specimen in the Zoological Gardens, Calcutta, presented by Mr. Rivers Thompson, and said to have been brought from the Karen Hills, Burma.

There is no bald space in front of the scrotum or around the genital orifice; hence it is probable that the prescrotal glands, if they exist, are ill-developed. The soles are naked to a greater extent than in *Paradoxurus*, and the first digit on both fore and hind feet is more remote from the others. In other respects the two genera are similar.

56. Arctogale leucotis. *The small-toothed Palm-Civet.*

Paguma trivirgata, *Gray, List Sp. Mam. B. M.* 1843, p. 55; *Cantor, J. A. S. B.* xv, p. 201 (*nec* Paradoxurus trivirgatus, *Gray,* 1832).
Paradoxurus leucotis, *Blyth, Horsf. Cat.* p. 66 (1851); *id. J. A. S. B.* xxvii, p. 274; *id. Mam. Birds Burma*, p. 26.
Paradoxurus prehensilis, *Sclater, P. Z. S.* 1877, p. 681, pl. lxxi, *nec* Viverra prehensilis, *Blainv.*
Arctogale trivirgata, *Gray, P. Z. S.* 1864, p. 543; *Mivart, P. Z. S.* 1882, p. 163, figs. 8 & 9.
Arctogale leucotis, *W. Blanf. P. Z. S.* 1885, p. 789.

Kyoung-na-rwek-phyu, Arakan; *Kyoung-na-ga,* Tenasserim; *Musáng-ákar,* Malay.

Fig. 30.—*Arctogale leucotis.* (P. Z. S. 1877, pl. lxxi.)

Tail about the same length as the head and body. Fur short, of uniform length, not harsh.

Skull narrow and elongate. Postorbital processes long, zygo-

matic arches weak. The bony palate extends more than half an inch behind the last upper molars.

Colour. Fulvous grey (whity-brown) to dusky grey, or occasionally brown above, much paler below. Fur in pale specimens sometimes grey throughout; in darker skins brown near the base, then grey, tipped on the back with dark brown or black. Along the

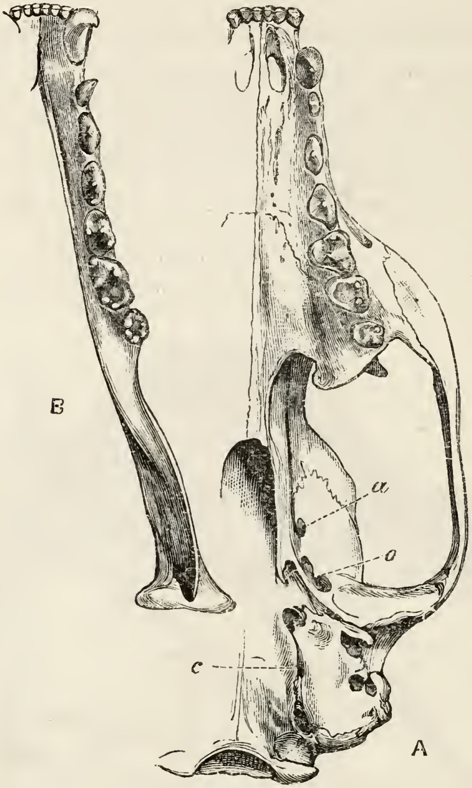

Fig. 31.—Half cranium (A) and mandible (B) of *Arctogale leucotis*, nat. size. *a*, anterior opening of alisphenoid canal; *o*, foramen ovale; *c*, carotid canal (compare fig. 15, p. 51, *ante*). (Mivart, P. Z. S. 1882.)

back run three longitudinal dark bands, either continuous or broken into spots; sometimes these bands are indistinct or wanting, but generally they are well marked. The head above, including the crown and ears, usually darker, often ashy or black; a narrow white line generally runs down the middle of the forehead and nose, or part of the distance. In Burmese specimens the tips of the ears are often whitish. Whiskers dark brown. Sides of neck pale, like the lower parts. Feet and terminal portion of tail brown or black.

Dimensions. Head and body of a large male 26·5 inches, tail 27. Skull 4 inches in basal length, 2·3 in zygomatic breadth.

Distribution. This well-marked form is found east of the Bay of Bengal, from Sylhet, and, according to Sterndale, Assam, through Arakan and Tenasserim to Malacca, Sumatra, and Java. Said by Mason to be common in Tenasserim.

Habits. Nothing particular recorded. When taken young *A. leucotis* is easily domesticated. Tickell and, probably, Mason mistook the Tenasserim form of *P. hermaphroditus* for this species.

The type of Blyth's *Paradoxurus leucotis*, that originally described by Horsfield, is now in the British Museum, and is a young and pale specimen of the present form.

Hemigale hardwickei (*Paradoxurus derbyanus*), a Malayan animal allied to *Paradoxurus*, and formerly referred to that genus, is distinguished by having the soles of the feet naked to a much smaller extent, though more than in *Viverra* or *Prionodon*, and by its dentition. The coloration is very peculiar, pale brownish grey, with a variable number (usually 5 or 6) of broad, dark transverse bands on the back, longitudinal stripes on the nape, and rings on the basal portion of the tail. This animal ranges from the Malay Peninsula to Borneo.

Genus **ARCTICTIS**, Temminck, 1824.

Syn. *Ictides,* Valenciennes.

Tail long and truly prehensile. Ears short, tufted. Feet thoroughly plantigrade, the whole hinder surface of tarsus and

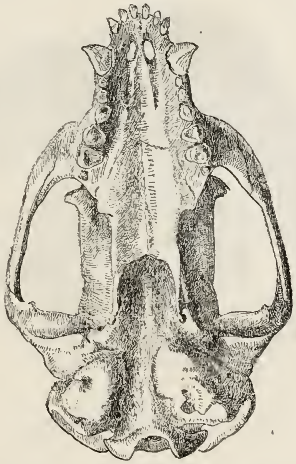

Fig. 32.—Skull of *Arctictis binturong.*

metatarsus being naked. Claws short, half retractile, compressed, slightly curved. Fur coarse and long. Pupil vertical. Large prescrotal glands opening into a deep fold.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{3-3}$, m. $\frac{2-2}{2-2}$; four lower premolars sometimes occur, and the last upper molar is often wanting. Canines large, compressed, very sharp behind, concave externally in front of posterior edge. Molars small, rounded; both they and the incisors are slightly separate from each other.

Vertebræ: C. 7, D. 13–14, L. 6–7, S. 3, C. 34.

Only a single species is known. A good account of the anatomy is given by Garrod, P. Z. S. 1873, p. 196, and 1878, p. 142. Flower and Mivart have confirmed the view adopted by Blyth and Jerdon, that the genus is closely allied to *Paradoxurus*.

57. **Arctictis binturong.** *The Bear-cat, or Binturong.*

Viverra ? binturong, *Raffles, Linn. Trans.* xiii, p. 253.
Arctictis binturong, *Temm. Mon. Mamm.* ii. p. 308; *Cantor, J. A. S. B.* xv, p. 192; *Blyth, Cat.* p. 49; *Jerdon, Mam.* p. 130; *Blyth, Mam. Birds Burma,* p. 26.

Young, Assamese; *Myouk-kyá* (Monkey-tiger), Burmese; *Untarong*, Malay.

Tail nearly as long as the head and body, very thick at the base, clothed with bristly, long, straggling hairs, longer than those of the body. Fur coarse and long, some piles longer than the rest of the fur, especially on the back.

In the skull the bony palate runs back for a considerable distance above the posterior nares. No pterygoid fossa.

Fig. 33.—*Arctictis binturong.*

Colour. Black, more or less grizzled on the head and outside of the fore limbs, and sometimes throughout the body. Fur and underfur either black throughout or brown at the base. On the head and outside of the fore limbs, and often on the back, there is a subterminal grey or rufous-grey ring on the longer hairs. In young

specimens there are long grey or rufous tips to the fur. The ears have a white border, but the tufts are black.

Dimensions. Head and body 28 to 33 inches, tail 26 to 27. An adult female skull measures 4·95 inches in basal length, and 2·95 in breadth across the zygomatic arches.

Distribution. From Assam, throughout Arakan, Tenasserim, Siam, and the Malay Peninsula to Sumatra and Java. The reports of this animal's occurrence in the Himalayas are of doubtful accuracy.

Habits. Like the *Paradoxuri*, *Arctictis* is omnivorous, living on small mammals, birds, fishes, earthworms, insects, and fruits; it is also nocturnal and arboreal, its power of climbing about trees being much aided by its prehensile tail. It is rather slow in its movements. Its ability to suspend itself by its tail has been questioned, but Blyth has shown (J. A. S. B. xvi, p. 864) that the young at all events can support itself by the extremity of the tail alone. Blyth also remarks that it is the only known placental mammal with a truly prehensile tail in the Old World.

This species inhabits wild forests, and, owing to its nocturnal and retiring habits, is seldom seen; it is said, however, to have a loud howl. It is naturally fierce, but when taken young is easily tamed, and becomes very gentle and playful. Of its breeding nothing appears to be known.

The only remaining member of the *Viverrinæ* found in South-eastern Asia that requires notice here is *Cynogale bennetti*, a remarkable aquatic type, somewhat resembling an otter in form. It is of a red-brown colour, with the feet webbed, and rather less naked beneath than in *Paradoxurus*, and a short tail. The teeth have long and sharp cusps, adapted for capturing fish, on which it lives. It is found in the Malay Peninsula (J. A. S. B. xv, p. 203), Sumatra, and Borneo.

Subfamily HERPESTINÆ.

Besides the characters already enumerated, most of the members of this subfamily present the peculiarity of the anus opening into a sac-like depression; but this character is ill-marked or absent in some of the common Indian species. There are several genera included, but all except one are peculiar to Africa or Madagascar. The only generic type within the Indian area is *Herpestes*, the various subdivisions, such as *Urva*, *Tæniogale*, &c., raised to generic rank by Hodgson, Gray, and others, not being distinguished by characters of more than specific importance.

Genus HERPESTES, Illiger, 1811.

Syn. *Mangusta*, Olivier?; *Ichneumon*, Lacép. *nec* L.; *Mungos*, Ogilby; *Urva*, *Mesobema*, Hodgson; *Osmetectis*, *Calogale*, *Galerella*, *Calictis*, *Tæniogale*, *Onychogale*, Gray.

Body long and slender, limbs short, muzzle pointed. Ears very short and rounded. Tail, in most species, long and conical, being

generally thick at the base, and covered with long hair. The feet are plantigrade, the extent to which the under surfaces of the tarsus and carpus are naked varying in different species, extending in some to the heel in the hind feet, whilst in others the proximal portion of the tarsus is hairy below. The fur is coarse, and the longer hairs ringed or annulated, that is marked with alternating dark and pale spaces. Toes five on all feet. Mammæ usually 3 pairs, but occasionally 2. In several species, and probably in all, there are anal glands.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, p. $\frac{4-4}{4-4}$, m. $\frac{2-2}{2-2}$. Teeth of the molar series with strong, sharply-pointed cusps. Vertebræ: C. 7, D. 13, L. 7, S. 3, C. 21–29. The bony orbits in the skull are, as a rule, complete in adults, in which there is a considerable contraction in the

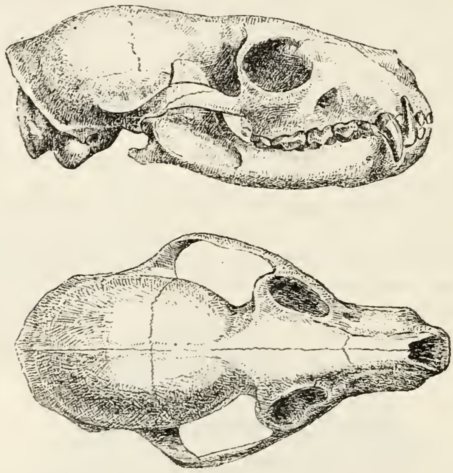

Fig. 34.—Skull of *Herpestes vitticollis*.

breadth of the cranium behind the long postorbital processes. This is much less conspicuous in young skulls. The brain-case behind the postorbital process is very long, when compared with the muzzle. The bony palate is continued above the posterior nares for a long distance behind the molars; the pterygoid bones are very short, and there is no true pterygoid fossa, the pterygoid process of the alisphenoid forming a short, broad fossa that terminates posteriorly just at the posterior opening of the alisphenoid canal, close to the anterior extremity of the pterygoid itself.

Some of the species of this genus are African, one, *H. ichneumon*, extending to Spain; others are Indian. The African have been recently revised by Mr. Oldfield Thomas (P. Z. S. 1882, p. 64); the Oriental by Dr. Anderson, in his 'Anatomical and Zoological Researches.' I entirely agree with the latter in his generic views:

but I am induced to carry the reduction of the number of species a little further than he does.

The Mungooses are terrestrial animals, seeking their prey on the ground, and very rarely climbing trees. They are active, bold, and predaceous, and live on small animals, mammals, birds, and reptiles, insects and eggs, occasionally eating fruit. They are deadly enemies to snakes, as described under *H. mungo*. They live in holes in the ground, hollow trees, and similar places. When angry or excited, they erect their long hairs, and especially those of the tail.

Synopsis of Indian, Ceylonese, and Burmese Species.

A. No neck-stripe nor black tail-tip.
  a. Fur close and short, longer hairs of back with 4 or 5 rings of colour: size small.
    a'. Tarsus and hind foot without claws, under 2 inches long .... *H. auropunctatus*, p. 121.
    b'. Tarsus and hind foot without claws, more than 2 inches .... *H. birmanicus*, p. 122.
  b. Fur longer, long hairs of back with more than 5 rings; size larger.
    a'. Naked sole extending to heel. Colour grey or rufous .... *H. mungo*, p. 123.
    b'. Naked sole not extending to heel.
      a''. Size large; tarsus and hind foot about 3 inches. Colour dark brown grizzled .... *H. fuscus*, p. 127.
      b''. Size smaller; tarsus and hind foot under 2·7 inches. Colour dark brown or rufous .... *H. fulvescens*, p. 127.
B. A black tail-tip, no neck-stripe .... *H. smithi*, p. 126.
C. A black tail-tip and black neck-stripe .... *H. vitticollis*, p. 128.
D. No black tail-tip, a white neck-stripe ...... *H. urva*, p. 129.

58. **Herpestes auropunctatus.** *The small Indian Mungoose.*

Mangusta auropunctata, *Hodgs. J. A. S. B.* v, p. 235 (1836).
Herpestes nipalensis, *Gray, Charlesworth's Mag. N. H.* i, p. 578 (1837); *Jerdon, Mam.* p. 136.
Herpestes pallipes, *Blyth, J. A. S. B.* xiv, p. 346 (1845); xv, p. 169.
Herpestes persicus, *Gray, P. Z. S.* 1864, p. 554; *W. Blanf. P. Z. S.* 1874, p. 662; *Anderson, An. Zool. Res.* p. 174.
Herpestes auropunctatus, *Anderson, ibid.* p. 172.

Mush-i-Khourma, Persian; *Núl*, Kashmir.

Size small. Fur short, even, close, moderately harsh, that of the tail considerably longer than that of the body. Tail, without hairs at end, about three quarters the length of the head and body. Naked sole not extending to the heel.

In the skull the pterygoid bones are not parallel, but diverge slightly behind.

Colour. Varying from light grey to dusky brown, minutely speckled with white or yellow. Lower parts paler and more uni-

form, or in western varieties white, and without any annulation on the hair. Dorsal fur brown at the base, then for some distance pale brownish grey or yellow, the longer hairs beyond this are blackish brown, then very pale brown or white, and, in some cases, tipped dark. Hairs of the tail with 5 to 7 alternations of pale and dark. There is some difference in the extent to which the pale and dark rings are developed; in very dark specimens the pale rings are greatly reduced in size and *vice versâ.*

Dimensions. Head and body 10 to 12 inches, tail, without hair at end, 7 to 10, tarsus and hind foot without claws 1·7 to 1·9; weight of a large male 18 ounces. A male skull measures 2·3 inches in basal length, 1·15 broad across zygomata.

Distribution. Throughout Northern India, being found in the lower Himalayas from Sikhim to Kashmir, in the North-west Provinces, Punjab, Sind, Baluchistan, South Afghanistan, and Southern Persia. To the eastward common in Lower Bengal about Calcutta, and found at Midnapur, but not recorded further south in the Peninsula. This species is found at Chittagong, and ranges through Cachar and Assam to Upper Burma, where it was procured by Anderson at Bhamo. It has not been found in Arakan, Pegu, or Tenasserim, but a single specimen, possibly imported, was obtained by Cantor in the Malay Peninsula. This is now in the British Museum, and is undistinguishable from Indian specimens.

Varieties. The Western form, found in Sind, Baluchistan, and Southern Persia, is very much paler and greyer in colour than Bengal and Himalayan skins usually are, and was distinguished by Blyth as *H. pallipes*, and by Gray subsequently as *H. persicus.* This was formerly classed separately by Anderson and myself. As, however, every intermediate gradation in colour can be found, I do not think the distinction can be maintained. The pterygoids in the skull of the pale-coloured variety are closer together anteriorly, and diverge more behind; but I can find no other difference, the discrepancies in breadth of the skull noticed by Anderson not being constant.

Habits. Nothing particular appears to have been recorded about this form, which is an active, inquisitive little animal, frequently seen in the daytime about bushes, hedgerows, and cultivated fields. The habits, so far as known, resemble those of *H. mungo.*

59. Herpestes birmanicus. *The small Burmese Mungoose.*

Herpestes auropunctatus birmanicus, *Thomas, A.M.N.H.* ser. 5, xvii, p. 84 (1886); *id. P.Z.S.* 1886, p. 58.

Size larger than that of *H. auropunctatus*, which this species resembles in the short, even fur and in structure generally. In the skull, the termination of the bony palate above the posterior nares is concave, and the pterygoids do not diverge.

Colour. Dark brown, minutely speckled with grey or yellowish grey throughout, lower parts very little paler than upper. Under-

fur dark brown at the base, then whitish, the longer hairs beyond this on the back are black, then comes a yellowish ring, and the tip is black. The black tips are only found on the upper parts. On the tail-hairs the alternations of colour are more numerous.

Dimensions. Skins measure: head and body about 14 or 15 inches, tail with hair 9 or 10, tarsus and hind foot 2·2. No measurements of fresh specimens are available. The skull of a male is 2·6 inches long to the back of the occipital condyles, 1·32 broad across the zygomatic arches.

Distribution. There are in the British Museum two specimens from Burma, one collected by Captain Wardlaw Ramsay, the other obtained by Mr. Oates in Pegu: a third specimen was collected by Mr. Hume in Manipur. I have also a skin from Cachar. This species probably replaces *H. auropunctatus* in Burma and some of the other countries east of the Bay of Bengal.

60. **Herpestes mungo.** *The common Indian Mungoose.*

Viverra mungo, *Gmel. Syst. Nat.* i, p. 84 (1788).
Herpestes frederici, *Desm. Dict. Sc. Nat.* xxix, p. 60 (1823).
Herpestes malaccensis, *Fischer, Syn. Mam.* p. 164 (1829); *Blyth, Cat.* p. 51; *Jerdon, Mam.* p. 134.
Mangusta (Herpestes) nyula, *Hodgson, J. A. S. B.* v, p. 236 (1836).
Mangusta mungos, *Elliot, Mad. Jour. L. S.* x, p. 102.
Herpestes pallidus, *Wagner, Schreb. Säugeth. Supp.* ii, p. 311, pl. cxvi G; *Anderson, An. Zool. Res.* p. 181.
Herpestes griseus, *Kelaart, Prod.* p. 41; *Blyth, Cat.* p. 51; *Jerdon, Mam.* p. 132; *Stoliczka, J. A. S. B.* xli, pt. 2, p. 227; *Thomas, P. Z. S.* 1886, p. 56, note; *nec* Ichneumon griseus, *Geoffr.*
Herpestes ferrugineus, *W. Blanf. P. Z. S.* 1874, p. 661, pl. lxxxi.
Herpestes andersoni, *Murray, Vertebrate Zoology of Sind*, p. 34 (1884).
Herpestes mungo, *W. Blanf. P. Z. S.* 1887, p. 631.

Newal, Newala, Nyul, or *Newar, Dhor, Rasu,* H.; *Mangús,* in the Deccan and Southern India; *Bin guidaro, Sarambumbui,* Ho Kol; *Koral,* Gond.; *Mungli,* Can.; *Mangisu, Yentawa,* Tel.; *Kiri* or *Kiripilai,* Tam.; *Kiri,* Mal.; *Mugatea,* Cing.

Hair long and somewhat ragged. Tail, without hair, a little shorter than the head and body. Tarsus naked to the heel, the hinder part of the naked sole narrow.

In adult skulls the orbit is complete behind. The bony palate extends above the posterior nares to about half the distance between the last molars and the posterior end of the pterygoids. Pterygoids parallel, not divergent.

Colour. Greyish brown, speckled with white or pale grey, sometimes with a ferruginous tinge on the head and feet. A variety is ferruginous throughout. Lower parts paler. Underfur light brown, longer hairs distinct in colour from the underfur, and marked by alternating rings of white or greyish white and dark brown, 4 or 5 of each on the hairs of the back. The dark and light rings are generally of nearly equal length, but occasionally the pale

rings are longer than the dark. The tips are often rufous brown. Claws dark brown.

Dimensions. Head and body 15 to 18 inches, tail 14 to 15; weight about 3 pounds. Males are considerably larger than females. A large skull, probably male, is 3 inches in basal length, and 1·65 in breadth across the zygomatic arches, whilst a small adult female skull measures only 2·7 inches by 1·5.

Distribution. Found throughout the peninsula of India, from the Himalayas to Cape Comorin, and also in Ceylon. *H. mungo* ranges on the west to Sind and Afghanistan, and doubtless into Baluchistan. I have a specimen of a peculiarly pale colour with very long hair from Hazára, west of Kashmir, but this species is not known to be found on the Himalayas at any elevation further east, though common near the foot of the hills. It occurs throughout Bengal, and is said to be found in Assam; but it has not been observed in Burma, and the single specimen obtained by Cantor in the Malay Peninsula may very probably have been imported, whilst the original derivation of Cuvier's type of *H. malaccensis* from Malacca is very doubtful.

Varieties. Blyth and Jerdon distinguished the Bengal race as *H. malaccensis.* This is generally darker in colour, with the head and legs more rufous, but some Bengal specimens are similar to those from Southern India, and there appears to be no constant distinction, either in colour or size. A richly ferruginous form is found in Sind, besides the common grey type, and is a well-marked variety. On account of the coloration and some apparent differences in the skull, I distinguished this as *H. ferrugineus*, but the skull characters appear due to immaturity. A very large, old example of this ferruginous variety is the type of Mr. Murray's *H. andersoni*, which he has very obligingly sent to me for comparison.

Habits. The common mungoose is found in hedgerows, thickets, groves of trees, cultivated fields, banks of streams, and broken bushy ground, but not commonly in dense forest. It is often found about houses. It lives and breeds in holes dug by itself. Very little appears to be known of its breeding-habits. It is often seen in pairs; the young are three or four in number, and are produced in the spring.

The food of this animal is varied. It lives principally upon rats and mice, snakes and lizards, such birds as it can capture, eggs and insects, but it eats fruit at times. The stomach of one killed near Secunderabad contained, according to McMaster, a quail, a small wasp's nest, a lizard (*Calotes versicolor*), a number of insects, and part of a custard apple. The mungoose is sanguinary and destructive, and when it gains access to tame rabbits, poultry, or pigeons, it, Jerdon says, "commits great havoc, sucking the blood only of several." He adds, "I have often seen it make a dash into a verandah where some cages of mynahs, parrakeets, &c. were daily placed, and endeavour to tear them from their cages."

The mungoose is easily tamed and becomes thoroughly domesti-

cated, very much attached to its owner, intelligent and amusing. An excellent account is given by Sterndale (Nat. Hist. Ind. Mam. p. 223) of one that he had tame, and that died of grief when separated for a time from its master. The itinerant showmen, who are common throughout India, are frequently accompanied by a tame mungoose, and most of the fights between these animals and snakes that are witnessed by Europeans are waged by such tame individuals. As is so commonly the case, a tame mungoose will doubtless attack a much more formidable opponent than a wild one would. Sterndale's mungoose once attacked a greyhound, and mortally injured a male bustard, *Eupodotis edwardsi*, a bird about six times the weight of its assailant.

Much has been written about the combats between this animal and venomous snakes, and about the immunity of the mungoose from the effects of the serpent's bite. The prevalent belief throughout oriental countries is, that the mungoose, when bitten, seeks for an antidote, a herb or a root known in India as *manguswail.* It is scarcely necessary to say that the story is destitute of foundation. There is, however, another view supported by some evidence, that the mungoose is less susceptible to snake-poison than other animals. The mungoose is not always willing to attack, though at other times he is ready enough to fight. I have not seen many combats, but so far as I can judge from the few I have witnessed, Jerdon and Sterndale are correct in their view that the mungoose usually escapes being bitten by his wonderful activity. He appears to wait until the snake makes a dart at him, and then suddenly pounces on the reptile's head, and crunches it to pieces. I have seen a mungoose eat up the head and poison-glands of a large cobra, so the poison must be harmless to the mucous membrane of the former animal. When excited, the mungoose erects its long stiff hair, and it must be very difficult for a snake to drive its fangs through this, and through the thick skin which all kinds of *Herpestes* possess. In all probability a mungoose is very rarely scratched by the fangs, and, if he is, very little poison can be injected. It has been repeatedly proved by experiment that a mungoose can be killed, like any other animal, if properly bitten by a venomous snake, though even in this case the effects appear to be produced after a longer period than with other mammals of the same size.

The mungoose is an excellent ratter, soon clearing a house of rats and mice. A tame individual in London is said to have killed, on one occasion, a dozen full-grown rats in less than a minute and a half. Within the last fifteen years the introduction of *H. mungo* into Jamaica is said to have resulted in a saving of from £100,000 to £150,000 annually, owing to the decreased number of the rats which destroy the sugar-canes (P. Z. S. 1882, p. 712).

The cry of this mungoose, according to Sterndale, is a grating mew, varied occasionally by a little querulous yelp, which seems to be given in an interrogative mood, when the animal is searching for anything; when angry it growls most audibly for so small a

beast, and the growling is generally accompanied by a bristling of the hair, especially of the tail. It is cleanly in its habits, and, after feeding, picks its teeth with its claws, a habit that has been noticed by more than one observer.

The name *H. griseus*, adopted by many authors for this species, is taken from Geoffroy's *Ichneumon griseus*, which does not, I think, belong to the Indian animal at all; whilst Gmelin's name, derived from the *Mungos* or *Viverra mungos* of Kaempfer and Linnæus, clearly by its name and description was intended for the common Indian mungoose, and has priority by more than twenty years.

61. **Herpestes smithi.** *The ruddy Mungoose.*

Herpestes smithii, *Gray, Charlesworth's Mag. Nat. Hist.* i, p. 578 (1837); *id. P. Z. S.* 1851, p. 131, pl. xxx; *Blyth, Cat.* p. 50; *Jerdon, Mam.* p. 135; *Anderson, An. Zool. Res.* p. 176.
Herpestes thysanurus, *Wagner, Münch. Gel. Anz.* ix, p. 440 (1839); *Schreb. Säugeth. Supp.* ii, p. 301.
Crossarchus rubiginosus, *Wagner, Schreb. Säugeth. Supp.* ii. p. 329.
Herpestes ellioti, *Blyth, J. A. S. B.* xx, p. 162.
Herpestes rubiginosus, *Kelaart, Prod.* p. 43.
Herpestes jerdonii *and* Calictis smithii, *Gray, P. Z. S.* 1864, pp. 550, 565.
Herpestes monticolus, *Jerdon, Mam.* p. 135.

Konda yentava, Tel.; *Erima-kiri-pilai*, Tam.; *Dito*, Cing.

Fur long, harsh, and rather ragged. Tail nearly as long as the head and body, or, including the terminal hair, longer. Naked sole beneath tarsus extending nearly to the heel but not quite.

Skull differing but little from that of *H. mungo*, except that the mesopterygoid fossa is narrower, and the pterygoids diverge slightly behind. The teeth are a little larger.

Colour. Varying from light brownish grey speckled with white as in *H. mungo*, to rufous or iron-grey, a mixture of black, ferruginous red, and white. The terminal portion of the tail, 3 or 4 inches long, jet-black, passing into ferruginous proximally, remainder of the tail concolorous with the body. Feet generally darker, rufous brown or blackish. Lower parts sometimes paler than back. Underfur grey to greyish brown, longer hairs with alternations of white and dark brown or black, usually four rings of each; tip from light brown to deep ferruginous, almost blood-red.

Dimensions. Head and body about 20 inches, tail 19. Some measurements are smaller. A male skull measures 3 inches in basal length, and 1·7 broad across the zygomatic arches.

Distribution. This species has a wide range in India, being found throughout the peninsula and Ceylon. Jerdon obtained it near Madras, near Nellore, and at the foot of the Nilgiris; Col. McMaster at Gawilgurh, Berar. Mr. Ball found it in Singhbhoom; I procured what I believe was this species in the Rájpipla hills east of Surat; there is a skin in Mr. Hume's collection from Sámbhur in Rájputána; and the type of *H. thysanurus*, which is

probably the same, was a Kashmir specimen. This form has not, however, been met with in the North-west Provinces or Bengal.

Varieties. The type of *H. smithi* is a very rufous skin, whilst that of *H. jerdoni* is almost as grey as *H. mungo.* But there is much variation, and in this as in other species the amount of rufous coloration is evidently very variable. The skulls are precisely similar. The measurements also show a remarkable variation, and it is just possible that a larger and a smaller form are confounded.

Habits. Very little has been recorded. The ruddy mungoose is chiefly found in thick forests.

62. Herpestes fuscus. *The Nilgiri brown Mungoose.*

Herpestes fuscus, *Waterhouse, P. Z. S.* 1838, p. 55; *Jerdon, Mam.* p. 136; *Anderson, An. Zool. Res.* p. 184, pl. viii, figs. 1, 2 (skull).

Size large. Tail a little shorter than the head and body. Hair on the tail longer than on the body. Fur long, not very harsh; underfur dense, long and woolly. Naked sole not extending to the heel.

In the only skull examined the orbit is nearly perfect. The pterygoid bones are parallel and peculiarly everted, being convex inside and concave externally. The second and third upper premolars with distinct anterior cusps. Last lower molar with three anterior cusps instead of two.

Colour. Blackish brown, minutely speckled with yellow or brownish white. Tail rather darker. Feet very dark. Underfur hair-brown, longer hairs with alternating rings of blackish brown and yellow or yellowish white, three or four of each, the dark rings much longer than the light.

Dimensions. Head and body 18 inches, tail with the hair at end 17; basal length of skull 3·2, zygomatic breadth 1·95.

Distribution. The Nilgiri and Travancore hills, and probably some other hill-ranges of Southern India. Anderson adds Ceylon, but without giving any authority, and I feel doubtful whether *H. fuscus* is found there, for it appears to be replaced by *H. fulvescens.*

Habits. Very little is known of this fine mungoose except that it inhabits the dense woods upon the Nilgiri hills, where it was obtained by Jerdon. It was procured in Travancore by Mr. Baker (J. A. S. B. xxviii, p. 283).

63. Herpestes fulvescens. *The Ceylon brown Mungoose.*

Herpestes fulvescens, *Kelaart, J. A. S. B.* xx, p. 162 (1851), xxi, p. 348; *id. Cat.* p. 52.
Herpestes flavidens, *Kelaart, J. A. S. B.* xx, p. 184; *id. Prod.* p. 44.
Cynictis maccarthiæ, *Gray, P. Z. S.* 1851, p. 131, pl. xxxi.
Onychogale maccarthiæ, *Gray, P. Z. S.* 1864, p. 570.
Herpestes maccarthiæ, *Anderson, An. Zool. Res.* p. 178.
Herpestes ceylanicus, *H. Nevill, Taprobanian,* i, p. 62.

Ram-mugatea, Cing.

Size of a small *H. mungo.* Naked sole not extending to the heel. Tail without the hair at the end about three quarters the length of the head and body. Fur less harsh than in most species of the genus, long, with a thick woolly underfur; hair of tail but little longer than that of body.

In the skull the orbit is imperfect (apparently from immaturity, however), and the pterygoid bones parallel.

Colour. Normally dark brown speckled with dull yellow, but some specimens are paler. Lower parts nearly as dark as upper; feet dusky. Tail the same colour as the body. Underfur brownish grey, darker near the body, the longer hairs of the back with alternating rings of pale brownish yellow and dark brown, three or four of each, the basal and terminal rings pale. Claws brown.

Dimensions. Head and body $16\frac{1}{2}$ inches, tail $12\frac{1}{4}$. The skull measures 2·7 inches in basal length, and 1·45 in zygomatic breadth.

Distribution. Peculiar to Ceylon. Kelaart's specimens were from the hill-region to the south; Gray's type was said to be from Jaffna, but had evidently been kept in confinement.

Kelaart's two names *fulvescens* and *flavidens* were published in a paper read before the Asiatic Society of Bengal, March 5th, 1851 (J. A. S. B. xx, p. 287). The former occurs first, and is in every way preferable. Gray's name *maccarthiæ* was given in a paper read before the Zoological Society of London, May 13, 1851. It is clear that Kelaart's name is the earlier. Gray at first referred the species to *Cynictis*, a South-African genus of *Herpestinæ* with but four toes on each hind foot, and subsequently made *H. maccarthiæ* into a special genus *Onychogale*, apparently on account of its long fore claws, a character which, as Anderson has pointed out, was entirely due to the type having been kept in confinement.

Some skins are paler and more rufous than others, and one in the British Museum is pale sandy. The normal colour is very similar to that of *H. javanicus*, which may be distinguished by its shorter tail. *H. fulvescens* is closely allied to *H. fuscus*, which it appears to represent in Ceylon, and from which it is chiefly distinguished by its much smaller size.

64. **Herpestes vitticollis.** *The stripe-necked Mungoose.*

Herpestes vitticollis, *Bennett, P. Z. S.* 1835, p. 67; *Kelaart, Prod.* p. 42; *Jerdon, Mam.* p. 137; *Anderson, An. Zool. Res.* p. 188, pl. ix, figs. 3, 4 (skull).

Mangusta vitticollis, *Elliot, Mad. Jour. L. S.* x, p. 103, with coloured plate.

Loko-mugatea, Cingalese.

This is the largest species found in Asia. Tail, including the long hair at the end, about three quarters the length of the head and body, without the terminal hair about three fifths. The fur long and harsh, that on the tail longest. Sole of the hind foot naked to the heel.

In the skull the bony palate runs far back, considerably more than half the distance between the posterior upper molars and the

end of the pterygoids, which diverge slightly. Teeth large, the hindmost upper and lower molars broader in proportion than in any other Indian species.

Colour. Varying from grizzled dusky iron-grey to rich unspeckled ferruginous or chestnut-red, the red colour being frequently confined to the hinder part of the body and tail, the head always iron-grey above. A black band down each side of the neck from behind the ear to the shoulder, with a paler or more rufous area above and below the band. Legs and feet unspeckled dark brown or black, and a long black tip to the tail. Fur brown at the base, the longer hairs with alternating rings of pale yellowish grey and black, 3 or 4 of each, the dark rings the longer, or there are one or two rings of each colour near the base of the hairs and all the terminal portion is ferruginous.

Dimensions. Head and body 21 inches; tail without hair at end about 13, with it 15; weight 6 lb. 10 oz. Basal length of skull 3·7 inches, zygomatic breadth 2·2.

Distribution. The hills near the west coast of India, from near Bombay to Cape Comorin, and Ceylon. Ceylon specimens appear more rufous than Indian.

Habits. But little known. Jerdon remarks that from its size, this species must be very destructive to game and the smaller quadrupeds. It is often seen on the Nilgiris, and appears abroad at all hours in the day, according to McMaster, who once observed a pair evidently hunting on scent, which they followed to earth, and they then began to burrow. Suddenly they started off at full pace in pursuit of something, probably, McMaster suggests, a hare, which had bolted from another opening of the burrow.

65. **Herpestes urva.** *The crab-eating Mungoose.*

Gulo urva, *Hodgson, J. A. S. B.* v, p. 238 (1836).
Urva cancrivora, *Hodgs. J. A. S. B.* vi, pp. 561, 564; *Jerdon, Mam.* p. 138.
Mesobema cancrivora, *Hodgs. J. A. S. B.* x, p. 910; *Calc. Journ. N. H.* ii. p. 214.
Herpestes urva, *Anderson, An. Zool. Res.* p. 189, pl. ix, figs. 5, 6, skull.
Arva, Nepalese.

Size large, approaching that of *H. vitticollis*. Form more robust than in most species of the genus. Tail about two thirds the length of the head and body. Fur of body and tail very long, coarse and ragged, underfur woolly. Naked sole of hind foot only extending about two thirds the distance to the heel. Mammæ 6, ventral. Two anal glands, one on each side, with external orifices.

In the skull the orbit is probably complete in old specimens. The termination of the bony palate above the posterior nares is concave.

Colour. Dusky iron-grey, or blackish with a greyish surface caused by the long whitish tips to the hairs. A well-marked

narrow white stripe runs along each side of the neck from the angle of the mouth to the shoulder. Head dark brown, speckled with white; legs and feet the same, but without any white, the feet often black. The woolly underfur dark brown at the base, then pale brownish yellow, the longer hairs brown close to the skin, then light brown or yellowish brown like the underfur for a considerable length, next black, also for a long distance, and whitish at the tips.

Fig. 35.—*Herpestes urva.*

Dimensions. Head and body 18 to 21 inches; tail without the hair at the end 11 to 12; weight (of a small specimen apparently) 4 pounds. A skull measures 3·3 inches in basal length and 2 in zygomatic breadth.

Distribution. The south-eastern Himalayas at low elevations, Assam, Arakan, Pegu, Tenasserim, and Southern China.

Habits. The heavy form of this mungoose is probably connected with somewhat different habits from those of the typical species, such as *H. mungo.* According to Hodgson *H. urva* is somewhat aquatic, and lives chiefly on frogs and crabs, which abound in the Himalayan and Burmese streams. Like other species, it lives in holes in the ground.

The anal glands are about the size of a cherry, and the animal has the power of squirting out a fœtid fluid from them backwards with great force. A description of these glands has been given by Dr. Campbell (J. A. S. B. vi, p. 565).

Two more species of the genus, *H. javanicus* and *H. brachyurus*, both of large size, are found in the Malay Peninsula and in some of the islands; whilst a third form, *H. semitorquatus*, is peculiar to Borneo. Some other Malay species have been described, but appear doubtfully distinct.

Family HYÆNIDÆ.

The last family of the *Æluroidea* that is found in the Indian area is represented by a single species, the common striped hyæna. But two other species exist, both African. All resemble dogs more than cats, but are more nearly related to the *Viverridæ*, and especially to the Herpestine subfamily, than to either *Felidæ* or *Canidæ*.

The head in hyænas is large and slightly elongated, the tail moderate, limbs rather long; the hallux and pollex are wanting, the tarsus and metatarsus entirely hairy. The feet have a median or plantar pad and one to each digit. The animal is truly digitigrade. The claws are but slightly curved, strong, blunt, and non-retractile.

The skull is remarkable for the great development of the sagittal crest, serving for the attachment of the powerful temporal muscles. The zygomatic arches are very strong. The auditory bulla is inflated but not divided; the paroccipital process distinct; there is neither alisphenoid canal nor pterygoid fossa. The palate extends back but a short distance behind the posterior molars. The teeth are well developed, the upper sectorial being particularly large.

By most naturalists all living hyænas have been classed as one genus, but some writers of late have distinguished the African spotted hyæna as *Crocuta*, on account of its having much smaller upper true molars with but one or two roots, less developed lower true molars, no mane, and some remarkable peculiarities about the female genital organs (Watson, P. Z. S. 1877, p. 369, 1881, p. 516; and Mivart, *ibid.* 1882, p. 198).

Genus **HYÆNA**, Brisson, 1756.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{3-3}$, m. $\frac{1-1}{1-1}$. The outer incisors much larger than the inner, canines and premolars large. Upper sectorial teeth very large, formed of a distinctly trilobed blade and a moderately developed inner tubercle at the anterior extremity of the tooth. Upper molar small and placed transversely close to the hinder edge of the sectorial, as in cats. Lower sectorial consisting of but little more than the bilobed blade. Vertebræ: C. 7, D. 15, L. 5, S. 4, C. 19.

The anatomy of the hyæna has been described by Daubenton in Buffon's 'Histoire Naturelle,' vol. ix, p. 280.

Fossil species are numerous, and no less than five have been recognized in the Siwalik beds of the Punjab, besides one species of an allied genus, called *Lepthyæna* by Lydekker. Remains of the African *H. crocuta* have been found in caves near Karnul, Madras.

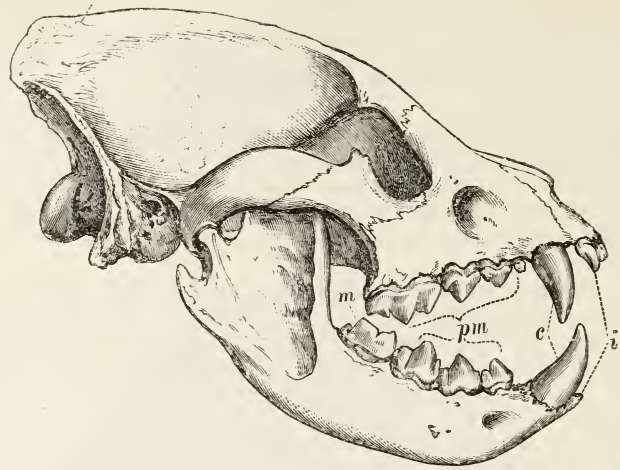

Fig. 36.—Skull of *Hyæna striata*. (Guide to the Galleries of Mammalia, British Museum.)

66. **Hyæna striata.** *The striped Hyæna.*

Hyæna striata, *Zimm. Geog. Gesch.* ii, p. 256 (1780); *Blyth, Cat.* p. 44; *Jerdon, Mam.* p. 118.

Lakar bagha, Lakar bágh or *Lakra, Jhirak, Hondar, Harvágh, Taras,* H. in various districts; *Taras* also Mahr. and Sindhi; *Cherak,* Sindhi; *Aptar,* Baluchi; *Renhra,* Gond; *Hebar kula,* Ho Kol; *Derko Tud,* Paharia of Rajmehal; *Dhopre,* Korku; *Kirba* and *Kut-kirba,* Can.; *Dúmul gúndu, Korna gúndu,* Tel.; *kaluthai-korachi,* Tam.

Tail about three sevenths the length of the body, and clothed with long hair. Hair of the median line on the neck and back long, forming a crest or mane. The hind legs considerably bent and shorter than the fore, the hind feet much smaller than the fore feet. A large post-anal glandular pouch receiving the secretions of the large anal scent-glands.

The upper true molar with three roots; lower true molar with an inner tubercle and a well-developed talon or heel.

Colour. Dirty grey, with narrow transverse tawny or blackish stripes on the body and legs.

Dimensions. Head and body $3\frac{1}{2}$ feet, tail with hair $1\frac{1}{2}$. Skull 8·5 inches in basal length, 6·4 broad across zygomatic arches. Weight of an adult 74 lbs.

Distribution. Throughout the Peninsula of India, rare in forests, abundant in hilly open country. It is very common throughout Central and North-western India, and extends through South-western Asia to Northern Africa. It has not been recorded from Ceylon or east of the Bay of Bengal, and is rare in Lower Bengal.

Habits. The hyæna is most common in the drier parts of India, and its chief haunts are rocky hills and deep ravines. I have on several occasions turned hyænas out of grass or bushes, and Jerdon notices having met with some in sugar-cane fields; but as a rule this animal remains in the daytime in caves amongst rocks, or in holes, dug by itself, in the sides of hills or of ravines.

It is a nocturnal animal, and although an occasional individual may be met with returning to its den in the early morning, its rambles are usually commenced after sunset and ended before sunrise. During the night it roams far and wide, and no tracks of wild animals are more common, in the countries where it is found, than its unmistakable footprints, very like a dog's in shape, but with the marks of the hind feet conspicuously smaller than those of the fore feet. Unlike the spotted hyæna, the striped species appears to be solitary in its habits, and it is rare to meet with more than two together.

The principal food of the hyæna consists of the carcases of animals that have died of disease or been killed by beasts of prey, and very often it carries off portions of the body to its den. I once shot one that was carrying away the hind leg of a nilgai. The powerful jaws and large teeth are admirably adapted for crushing bones, which are consumed by hyænas, after the flesh has been picked off by vultures and jackals. Occasionally sheep or goats, and more often dogs, are carried off by hyænas, and the latter at all events are often taken alive to the animal's den. Jerdon relates an instance in which a small dog belonging to an officer at Dumoh was carried away, but procured alive the next day from a cave by some sepoys, who killed the hyæna. Fragments of bones are often found around a hyæna's retreat, together with the peculiar dung of the animal, which dries into hard white balls, known as *alba græca*, chiefly composed of fragments of bone, and so indestructible that they have been found fossilized in caves that had been tenanted by extinct forms of these animals.

The hyæna is universally despised for its cowardice; despite its powerful teeth, it rarely attemps to defend itself. It is occasionally ridden down and speared, but unless the ground is peculiarly favourable for horses, it will give a good run before being killed, not on account of its speed, for it is easily caught by a good horse, but from the way it turns and doubles. As a rule, it shows no fight when brought to bay. McMaster, in his excellent Notes, relates an instance in which a hyæna, after being slightly wounded by a spear, was pursued by a game old Arab horse who had lost his rider, and who attempted to seize the hyæna with his teeth and to strike him with his fore foot, an attack that the hunted animal only acknowledged by tucking its tail tightly between its legs.

The cry of the striped hyæna is much less frequently heard than that of the spotted species in the countries inhabited by each respectively, nor are their calls the same, though there is some similarity between them, and both are peculiarly loud and disagreeable.

Hyænas are easily tamed if captured young, and become very docile and greatly attached to their masters.

The number of young in a litter is, I believe, 3 or 4, but about all points connected with the breeding more information is required. The period of gestation does not appear to have been observed.

CYNOIDEA.

Family CANIDÆ.

The *Cynoidea*, consisting of a single family, *Canidæ*, in which are included dogs, wolves, jackals, and foxes, form a group of Carnivores as easily recognized and as distinct as the *Felidæ*.

The head throughout the family is elongate, tail moderate, limbs fairly developed, and the feet truly digitigrade, with the pads similar in number and form to those in cats and hyænas. The print of a canine foot is very similar in shape to that of a hyæna's, both differs from a cat's in having the two middle toe-pads at a greater distance in advance of the other two, and in the whole foot being much longer in proportion to its breadth. Throughout the *Canidæ* there are four toes on the hind foot, except in some cases of domestic dogs, which have five, and all, except the African genus *Lycaon*, have five toes on the fore feet, the pollex being much shorter than the other digits and not reaching the ground. The claws are blunt, nearly straight, and non-retractile.

In the skull the muzzle is much lengthened, the postorbital processes are short, the auditory bullæ inflated but not divided into two by septa; a paroccipital process is attached to the hinder part of each bulla, but projects behind. There is an alisphenoid canal, but only a rudimentary pterygoid fossa.

There are always four premolars on each side of each jaw. The upper sectorial consists of a stout blade, of which the anterior cusp is large, conical, and pointed backwards; the posterior cusp is in the form of a compressed ridge; the inner lobe is very small and placed quite at the fore part of the tooth. The first upper molar is large, and much broader than long, its outer border bicuspid; the second molar is of the same shape but smaller. The lower sectorial is a very large tooth, with a strong compressed bilobed blade, the hinder lobe the larger and more pointed, a small but distinct inner tubercle inside the posterior lobe of the blade, and a broad low tuberculated heel. The second lower molar is less than half the size of the first or sectorial; the third lower molar, when present, is quite small.

Clavicles exist but are rudimentary. The vertebral formula is C. 7, D. 13, L. 7, S. 3, C. 17–22.

The family has an almost world-wide distribution, and all the forms are so closely similar in all essential structural characters

that generic distinctions are founded on characters of less structural importance than in most families of Mammalia. For an account of the cranial and dental characters see Huxley, P. Z. S. 1880, p. 238.

The *Canidæ* are mostly carnivorous. Many are predatory, and several hunt in troops. Some feed on carrion, on insects, or, in part, on fruit. All have a very acute sense of smell, and both sight and hearing are highly developed.

Three Indian genera are recognized, and may be thus distinguished:

A. A frontal sinus present; postorbital process smooth and convex above; tail, including hair at end (in all Indian forms), less than half the length of the head and body.
  a. Seven teeth in lower molar series .... CANIS.
  b. Six teeth in lower molar series .... CYON.
B. No frontal sinus, postorbital process concave above; tail more than half the length of the head and body .... VULPES.

Many fossil Canines are known. In the Siwalik beds of the Punjab a wolf, *Canis cautleyi*, and a fox, *Vulpes curvipalatus*, have been found, and also a species of the extinct genus *Amphicyon*, which was in some respects intermediate between dogs and bears.

Genus **CANIS**, Linn. (1766).

Syn. *Lupus, Saccalius, Oxygous*, Ham. Smith.

In this genus are comprised the wild wolves and jackals and domestic dogs, the latter being apparently the descendants of several different wild forms, amongst which the common wolf and the common jackal are two of the principal.

The dentition is i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{2-2}{3-3}$. The teeth are powerful. The tail in all wild species forms a moderate brush, the hair being longer than on the body. The pupil is round. There are generally 10, more rarely 8, mammæ.

Synopsis of Indian, Ceylonese, and Burmese Species.

A. Head and body about 3 feet 6 inches long; much woolly underfur .... *C. lupus*, p. 135.
B. Head and body about 3 feet long; little or no woolly underfur .... *C. pallipes*, p. 137.
C. Head and body 2 feet to 2 feet 6 inches long .... *C. aureus*, p. 140.

67. **Canis lupus.** *The Wolf.*

Canis lupus, *L. Syst. Nat.* ed. xii, i, p. 58 (1766); *Hutton, J. A. S. B.* xiv, p. 345; *Scully, P. Z. S.* 1881, p. 201.
Lupus laniger, *Hodgs. Calc. Journ. N. H.* vii, p. 474; *Horsfield, A. M. N. H.* ser. 2, xvi, p. 107 (1835); *Blyth, J. A. S. B.* xvi, pt. 2, p. 1176.
Canis chanco, *Gray, P. Z. S.* 1863, p. 94.
Canis niger, *Sclater, P. Z. S.* 1874, p. 654, pl. lxxviii.

Gúrg, Persian; *Gúrk*, Baluch.; *Kharmá*, Brahni; *Rátnahún*, Kashmir; *Chángú*, Tibetan.

Size large. Tail with hair considerably less than half the length of the head and body, without hair about one third. Fur long and thick, with woolly underfur.

Colour. On the upper parts and the outside of the limbs rufous or yellowish grey, much mixed with black in some skins, lower parts whitish. Underfur on back pale slaty or light brown with coarse whitish hairs intermixed, longer hairs light brown tipped with black; sometimes beyond the black there is a white termination. The tail is often tipped with black. Some individuals are much paler than others, some are quite black.

Dimensions. Head and body 3 feet 6 inches to 3 feet 9 inches, tail without hair 15 to 16 inches, with hair 18 or 19, hind foot from heel 9, ear outside 4·5; height 2 feet 4 inches. A large skull measures 8·7 inches long in basal length, 5·5 broad across the zygomatic arches; a smaller but fully adult skull is 8 inches long, 4·8 broad.

Distribution. Throughout the Palæarctic region, extending into Baluchistan, and Western Sind (where a specimen has been obtained by Mr. J Murray), and probably into the Northern Punjab, as a skull from the Salt Range, collected by Mr. Theobald and now in the British Museum, appears to belong to this and not to the next species. The common wolf, if, as I believe, *C. laniger* is identical, inhabits all countries north of the Himalayan range.

Varieties. The Sind, Baluchistan, and Gilgit animals appear undistinguishable from European wolves. The variety found in Tibet and Ladák is, however, very pale-coloured, with woolly fur, and has generally been distinguished as *C. laniger*. I thought at one time that the dentition was different, the upper sectorial in *C. laniger* being generally shorter than the two upper true molars taken together, whilst the reverse was believed to be the case in *C. lupus* (P. A. S. B. 1877, p. 116); but Huxley in his paper already quoted (p. 279) has shown that the teeth of both European and Tibetan wolves vary in this respect, and the difference in the fur appears due to climate. The cranial distinctions mentioned by Blyth (J. A. S. B. xxiii, p. 733) are probably caused by age. The black Tibetan wolf, classed apart by some, is evidently a variety similar to the black European wolf that was called *Canis lycaon* by Schreber.

Habits. The common wolf plays as large a part in story and myth amongst European nations as the tiger does in India. The wolf's habits are well known, though, as in the case of the great feline beasts of prey, the terror inspired by him has invested him, in popular lore, with many imaginary attributes.

Wolves are found both in open country and forests. As a rule they occur solitary or in pairs, but at times, and especially in the winter, they associate in packs, sometimes of large numbers. They live upon any mammals or birds that they can kill; they carry off

children, sheep, and goats, and when pressed by hunger attack men. Horses and cattle are only killed when several wolves combine. Carrion is readily eaten by these animals, and in case of need they are said to feed upon vegetable substances, such as buds of trees, lichens, and moss.

Although wolves prey to a considerable extent by night, they are by no means exclusively nocturnal in their habits. Their principal cry is a loud howl, which serves as a call.

The pairing-time is from December to April, the period of gestation 63 days, so that the young, varying in number from four to nine, are born in the spring or early summer. Wolves breed in thickets or in holes in the ground. The whelps are not full-grown and capable of propagating until the third year after their birth. The duration of life is from 12 to 15 years. Young wolves are easily tamed.

68. **Canis pallipes.** *The Indian Wolf.*

Canis pallipes, *Sykes, P. Z. S.* 1831, p. 101; *Blyth, Cat.* p. 39; *Jerdon, Mam.* p. 139.

Canis lupus, *Elliot, Madr. Journ. L. S.* x, p. 101; *Blyth, J. A. S. B.* xi, p. 596.

Bheriya, Gúrg, Hondár, Nekra, Bighána, H.; *Bagyár,* Sindhi; *Lándgá,* Gond and Dakhini; *Tola,* Can.; *Toralú,* Tel.

Structure generally similar to that of *C. lupus,* but the animal is smaller and slighter, and the fur shorter, with little or no woolly underfur. Mammæ 10.

Colour. Greyish fulvous, usually with a brownish tinge, sometimes much mixed with black on the back; some have a reddish tinge, and occasionally it is said that a thoroughly rufous individual is met with. All I have seen are, however, browner than *C. lupus* generally is, and of an earthy grey colour. Hair of varying shades of light brown from the base to near the end; tips black on the back. Coarse white hairs are mixed with the finer fur near the skin. The hairs on the tail have generally black tips. Lower parts dingy white. The young are sooty brown, with a milk-white chest-spot, which disappears about the sixth week from birth, when a dark collar appears below the neck, but is lost at maturity.

Dimensions. Head and body about 3 feet, tail with hair 16 to 17 inches. Skull of an adult male from Sámbhar 6·85 inches in basal length, 4·4 broad. Weight of a female 42 lbs.

Distribution. The Indian Peninsula south of the Himalayas, especially in open plain country; rare in wooded districts and amongst hills. I have never heard of this species occurring on the Malabar coast. Rare in Lower Bengal. Unknown further east: not found in the Himalaya, and apparently replaced by *C. lupus* beyond the Indus, though occasionally seen west of the river. No wolf has been recorded from Ceylon.

Habits. Very similar to those of *C. lupus*, except that the Indian wolf, although somewhat gregarious, is not known to associate in large packs (I have never heard of more than six to eight together). It is also rather a silent animal, but sometimes, Jerdon says, it barks like a pariah dog. It is rarely, if ever, heard to howl.

Indian wolves prey on all mammals or birds they can kill, but especially on sheep, goats, and antelopes. Instances are not rare of their attacking man, two or more combining for the purpose; and they, in some parts of India, carry away a large number of children yearly, usually taking them from villages. They course and run down hares and foxes, and occasionally attack cattle. They not unfrequently kill dogs.

Like all wild canines, these animals are very intelligent and cunning, and many of the stories told of the stratagems they employ to secure their prey appear to be well authenticated. One plan, vouched for by several observers, is that of part of the pack driving antelopes or gazelles across a spot where others of the pack are lying in ambush, either in ravines or in hollows scratched by themselves in the ground. Some wolves, too, are said to lie in wait hidden until antelopes approach them while feeding. A remarkable story is related by a writer in the 'Asian,' who states that he saw a wolf rolling on its back with its legs in the air, whilst some antelopes that were attracted to approach by curiosity advanced to within sixty or seventy yards; then they were accidentally disturbed, and two other wolves, that had been lying in ambush 100 yards apart in advance of the third, jumped up. It is also said that when wolves attack sheep, part of the pack attack and keep the dogs in check, whilst others carry off the prey.

A somewhat similar story is related by Forsyth, except that the victims were children. In the Dumoh district of the Central Provinces an old she-wolf and a full-grown cub haunted a patch of bushes and grass near a village standing on the slope of a hill, down which ran the main street, where children were always at play. The smaller wolf hid amongst bushes between the village and the bottom of the hill, whilst the larger animal went round to the top, and, watching its opportunity, ran down the street, carrying off a child on the way. At first the people used to pursue, and sometimes made the marauder drop his prey; but in that case the companion wolf usually succeeded in carrying off another of the children in the confusion, whilst the child first seized was generally so injured as to be beyond recovery. In this, as in many other similar cases, a very wide-spread superstition prevented the villagers from hunting down and killing the animals; and Forsyth actually found it difficult to get men to assist him in shooting the brutes, in which he fortunately succeeded.

The story illustrates both the cunning and the boldness of the Indian wolf. I myself saw one run out of a village in the middle of the day with a young goat and escape with it in spite of the villagers' pursuit.

The great aversion to killing a wolf that exists in many parts of India is due, I am told by Mr. Theobald, to a widely spread belief that the blood of a wolf, if shed upon the lands of a village, renders them unfruitful.

The Indian wolf has both speed and endurance, and has very rarely, if ever, been run down and speared from horseback, though the feat has often been attempted. McMaster, after briefly describing an unsuccessful attempt, very appropriately quotes Byron's lines in 'Mazeppa' about wolves:—

> "With their long gallop, which can tire
> The hound's deep hate and hunter's fire."

If hunted with greyhounds a wolf generally, after going for some distance, turns upon the dogs and chases them back to the huntsman. Instances of this are given by both Jerdon and Forsyth; but the latter relates how in one case a wolf that had chased back two greyhounds met his match in a bull mastiff. Jerdon states that a wolf once joined his greyhounds in hunting a fox.

In the Indian desert between Rájputána and Sind wolves are said by Sir B. Frere (Journ. R. Geogr. Soc. 1870, p. 204) to be dug or smoked out of their dens amongst the sand-hills. This is generally done about midday in the hottest part of the hot season; the men engaged protect their feet with folds of raw hide, and if the wolves are not clubbed or speared at once they are easily run down, as the hot sand blisters their feet and disables them.

I was told by Mr. Le Mesurier, formerly chief engineer of the Great Indian Peninsular Railway, that he succeeded in capturing many wolves in a pitfall consisting of a circular trench with perpendicular sides, and too deep for the animal to jump out of. On the ground left at the original level in the middle of the circular trench, a goat was tethered, and the trench was thinly covered with sticks and straw, that gave under the wolf's weight.

Indian wolves breed in holes or in caves among rocks. Dr. Bonavia, in a letter published in 'Nature' for 1875 (vol. xii, p. 67), states that the young vary in number from three to eight, and are born from October to December, chiefly in the latter month. He adds that they are born blind and with drooping ears. The young are easily tamed, and they have all the habits of dogs *; indeed, the common Indian dogs may be in part descended from wolves, although they are probably chiefly derived from jackals. There is some evidence to show that the Indian wolf occasionally breeds with the village dogs; whilst Sir B. Frere (Journ. R. Geogr. Soc. 1870, p. 205) mentions that in the Indian desert a pariah bitch was known to associate with a pack of wolves.

Stories about wolf-reared children are common in Northern India, especially in Oudh. Particulars of several supposed cases

* A curious instance may be mentioned. Dr. J. Anderson gave two young tame wolves a teal that was rather high. They would not eat it, but rolled over on it exactly as many dogs would do.

were collected by Colonel Sleeman, and several are recorded by Sir R. Murchison (A. M. N. H. 2, viii, p. 153) and Mr. Ball (P. A. S. B. 1873, p. 128, and 'Jungle Life,' pp. 455–466). It is doubtful how far any are authentic. All the children were boys, and all appear to have been idiots.

69. **Canis aureus.** *The Jackal.*

Canis aureus, *Linn. Syst. Nat.* i, p. 59 (1766); *Elliot, Madr. Journ. L. S.* x, p. 101; *Blyth, Cat.* p. 40; *Jerdon, Mam.* p. 142.
Canis aureus indicus, *Hodgson, As. Res.* xviii, p. 237.
Sacalius indicus *and* Oxygoüs indicus, *Hodgs. J. A. S. B.* x, p. 908.

Gidár, *Siyál*, or *Shiál*, *Phiál*, H.; *Laraiya*, Bandelkand; *Shigal*, Pers.; *Srigala*, Sansc.; *Shál* ♂, *Sháaj* ♀, Kashmiri; *Toláqh*, Baluchi; *Kolá*, Mahr. and Dakh.; *Karincha*, Ho Kol; *Kolial*, *Nerka*, Gond.; *Nari*, Can.; *Kalla-Nari*, Tam.; *Nakka*, Tel.; *Karaken*, *Nari*, Mal.; *Naria*, Cing.; *Amu*, Bhot.; *Hiyál*, Assamese; *Meshrong*, Kachari; *Hijai*, *Joksat*, Mikir; *Hian*, Naga; *Mye-khwe*, Burm.

Tail with the hair at the end about one third the length of the head and body. As a rule, the upper sectorial is much shorter than the two true upper molars taken together; but in two out of twelve measurements given by Huxley the length is the same. Mammæ 10.

Colour. Pale isabelline to pale rufous, more or less mixed with black on the upper parts; muzzle, ears, and outside of limbs more rufous; lower parts paler, sometimes nearly white; hair of the fore neck with dusky tips. The underfur on the back is brown, paler at the base, the longer hairs on the back beyond the underfur grey with black tips. The tail-hairs are reddish brown, with long black terminations, making a black tail-tip. Bright rufous, coal-black, and pure white albino individuals have also been recorded (Blyth, J. A. S. B. xxvii, p. 275).

Dimensions. Variable, some animals being much larger than others. The head and body certainly vary from 2 feet to 2 feet 6 inches in length, and I have seen measurements given of 2 feet 8 inches, though these must, I think, have been taken on skins. A large male from the Nipalese Terai measured: head and body 30 inches, tail without hair at the end 9, with hair 11, ear 3·2; weight 20 lbs. A small female from Rájputána measured: head and body 24·6, tail without hair 9, with hair 12·1, ear 3·2, hind foot from heel 5·5. Skulls are also very variable (see Huxley, P. Z. S. 1880, p. 277); a large one measures 5·8 inches in basal length and 3·5 in zygomatic breadth, an adult female 4·95 by 2·9.

Distribution. The jackal is found throughout the whole of India and Ceylon, on hills and plains, in forest and open country, and even in populous cities. It ascends the Himalayas to an elevation of 3000 or 4000 feet, and is occasionally found higher, especially around hill-stations, whilst it is common on the Nilgiris in Southern India. It is more rare east of the Bay of Bengal, but is

found in Assam and Cachar, and is not uncommon at Akyab and about Thayet Myo in Northern Pegu. It has also recently been observed close to Mandalay. The only place where I have heard of its occurrence farther south or east is near Moulmain*, where Mr. Theobald tells me he once saw two; but it is possible these might have been introduced. West of India it extends throughout South-western Asia to the Caucasus, and is found in South-eastern Europe in Greece and Turkey, and as far west as Dalmatia, also throughout Northern Africa, being replaced by closely allied species in the Ethiopian region.

Habits. Jackals are found singly or two or more together, and they sometimes associate in considerable numbers, especially at night, as is shown by their howlings. They are principally nocturnal, more so, I think, than the Indian wolf, but by no means exclusively; in the cold season they may be seen about at all hours. Their food is very varied, consisting of carrion of all kinds, any beasts or birds that they can master, and, in default of animal food, fruit. The jackal is one of the common scavengers of towns and villages, feeding on offal or dead carcases of any kind, and occasionally killing poultry or even lambs or kids. "Sickly sheep and goats usually fall a prey to him, and a wounded antelope is pretty certain to be tracked and hunted to death by jackals" (*Jerdon*). Amongst fruits, he especially feeds on *ber* (*Zizyphus*), and he is said in several parts of India to be very fond of sugar-cane and of maize. "In Wynaad, as well as in Ceylon, he devours considerable quantities of ripe coffee-berries; the seeds pass through him, well pulped, and are found and picked up by the coolies; it is asserted that the seeds so found make the best coffee!" (*Jerdon*). As Sterndale explains, these seeds are the best because the jackals select the finest fruit.

The cry of the jackal is familiar to all who have ever resided in the countries inhabited by the animal, and consists of two parts—a long wailing howl three or four times repeated, each repetition in a note a little higher than the preceding, and then a succession of usually three quick yelps, also repeated two or three times. The common Anglo-Indian version of "Dead Hindoo; where, where, where," gives some idea of the call. In one African jackal, *C. variegatus* of Abyssinia, the second portion of the cry is entirely wanting.

There is, however, another, a very peculiar call, only uttered by the jackal, it is believed, when a tiger or leopard is in the neighbourhood, and certainly uttered upon such occasions. The cry is unmistakable, I have several times heard it; but the jackal that makes it carries us at once into the region of fable and folk-lore. The same story that has existed on the shores of the Mediterranean for two thousand years at least, that a jackal acts as scout for the

* There are, however, in the Leyden Museum two stuffed specimens of this animal collected by Diard, and one of them is labelled from Malacca, the others from Borneo. It is impossible to say whether the localities are correct.

lion, or "lion's provider," and is repaid by a share of the prey, is commonly believed with regard to the tiger in India; and it is this peculiar jackal, known as *Pheál*, or *Phiou*, or *Phnew* (see Torrens, J. A. S. B. xviii, p. 788) in Northern India, the name being taken from the cry, and as *Bhálú* or *Kol bhálú* in Southern and Western India, that is said to invariably precede the tiger and to make the call just noticed. Several observers have, however, remarked that the jackal which makes the cry follows the tiger and does not precede him; and Mr. Blyth has observed that a pariah dog, on sniffing a collection of caged tigers in Calcutta, set up a most extraordinary howl, probably similar to that of the *Pheál*. Jerdon gives an excellent abstract of the opinions expressed by various writers, and concludes, as others have done, that the cry is an alarm-note. This appears probable; tigers, if they have an opportunity and are hungry, may kill and eat jackals, and leopards certainly do so.

Another belief, which appears widely diffused in India and Ceylon, is that a horn grows on the head of some jackals, and is of great virtue to its possessor.

The jackal is occasionally hunted by hounds, and gives a good run, but is quickly caught by greyhounds, who, however, cannot always dispose of him easily. He is, Jerdon says, very tenacious of life, and shams dead in a way to deceive even experienced sportsmen.

The period of gestation in the jackal is usually said to be sixty-three days, the same as in the wolf and dog; but, as might be expected, there is some variation, and there appears good reason for believing that the time in the jackal is a few days less * on an average. The number of young in a litter is about four; the female brings forth in holes in the ground, occasionally (as Jerdon remarks) in dry drains. That some breeds of domestic dogs, perhaps all the smaller races, are derived from jackals appears to be the opinion of most competent naturalists. The two breed together freely, and it is probable that some of the jackal-like dogs seen about Indian villages may be hybrids.

Jackals are liable to attacks of rabies, and mad animals are not uncommon, many cases of hydrophobia having resulted from their bites both in men and animals.

Genus **CYON**, Hodgson (1838).

Syn. *Cuon*, Hodgson; *Chrysæus*, Ham. Smith.

There are only two true molars on each side of the lower jaw, instead of three, as in *Canis*, the dentition being :—i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$,

* The subject is fully discussed by Darwin ('Animals and Plants under Domestication,' i, p. 29). The question of the origin of domestic dogs is there treated at length.

pm. $\frac{4-4}{4-4}$, m. $\frac{2-2}{2-2}$. The muzzle is proportionally shorter, and the line of the face, when viewed from the side, is slightly convex, instead of being straight or concave as in other *Canidæ*.

The mammæ are more numerous, being 12 or 14 instead of 10. There is long hair between the foot-pads.

In all other respects the genus *Cyon* agrees with *Canis*. *Cyon* has a very peculiar geographical distribution, being found in Central Asia as far north as the Altai, the Amurland, and Sagalien, and throughout the Oriental region, but not, so far as is known, in Northern China or Japan.

There is some doubt about the specific characters, but two distinguishable forms appear to inhabit our area *.

Synopsis of Indian and Burmese Species.

A. Larger and stouter; hair long, with woolly underfur, ferruginous red to tawny. Skull 6·75 to 7 inches long; tarsus and hind foot over 7 inches .... *C. dukhunensis*, p. 143.

B. Smaller and slighter; hair short, no underfur, brighter ferruginous. Skull 6·25 inches long, tarsus 6 .... *C. rutilans*, p. 147.

The term "wild dog" applied to these animals is clearly a misnomer, for in every important detail in which the genus *Cyon* differs from *Canis* (wolves and jackals)—in the form of the skull, the dentition, and the number of mammæ—domestic dogs agree with the latter and not with the former. The name has doubtless been applied to the present genus on account of its hunting in packs, like hounds, its fine handsome and bold appearance, and its courage.

A description of the anatomy of this genus is given by Dr. Murie (P. Z. S. 1872, p. 715). The anal glands have been described by Hodgson (Calc. Journ. N. H. ii, p. 412), and the skeleton by Dr. Campbell (*ibid.* p. 209). The strong and unpleasant odour of the animal, which resembles that of the jackal, appears due, in part, to the secretion from these glands.

70. **Cyon dukhunensis.** *The Indian wild Dog.*

Canis dukhunensis, *Sykes, P. Z. S.* 1831, p. 100, 1832, p. 15; *Blyth, J. A. S. B.* xi, p. 591.

Canis primævus, *Hodgson, As. Res.* xviii, pt. 2, p. 221 (1833), with figure.

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* These were united by Blyth, Jerdon, Murie (P. Z. S. 1872, p. 720), and others, and I am by no means confident that the distinctions here pointed out are sufficiently constant to justify separation, but they are found in all the specimens I have been able to examine—seven or eight of *C. dukhunensis* or *primævus*, and four of *C. rutilans*.

Cuon primævus, *Hodgs. A. M. N. H.* i, p. 152 (1838); *Calc. Journ. N. H.* ii, pp. 208, 412; *Adams, P. Z. S.* 1858, p. 514.
? Cuon grayiformis, *Hodgs. Cat. Mam. &c. Nepal & Tibet B. M.* 2nd ed. p. 5 (1863).
Cuon rutilans, *Blyth, Cat.* p. 37; *Jerdon, Mam.* p. 145 (*nec Müller*).

Son-kutta, Rám-kutta, Jangli, or *Ban-kutta,* H.; *Kolsun, Kolasna, Kolasra, Kolsa,* Mahr.; *Eram-naiko,* Gond.; *Tani,* Ho Kol; *Vatai-karau,* Tam.; *Reza-Kútá, Adavi-Kútá,* Tel.; *Shin-nai,* Mal.; *Rám-hun,* Kashmir; *Siddaki,* Ladák; *Bhaosa, Bhúnsa, Buánsú,* in the Himalayas from Simla to Nipal; *Hazí, Phará,* Tibetan; *Paoho,* Bhot.; *Sa-túm,* Lepcha.

The general form is rather that of the jackal than of the wolf, the legs being shorter than in the latter. Fur long, with thick woolly underfur in Tibetan and Himalayan skins. The tail is a good brush. General form stout. The upper sectorial is decidedly longer than the two upper true molars together.

Colour. On upper parts generally rusty red, varying in some specimens to rufous grey or even light brownish grey, paler below. The colour is generally not uniform, being variegated by dark tips to the dorsal hair. The underfur, when present, varies in colour from light brown to dull rufous on the upper parts, and has light-coloured coarser hairs intermixed; the longer hairs are light rufous, with dark rusty-red tips. Terminal portion of tail black (very rarely the extreme end is whitish). The young animals are sooty brown throughout.

Dimensions. Head and body of a male 37·5 inches, tail without hair 8, with hair 14½, tarsus and hind foot 7⅝; weight 27 lbs. (*Hodgson*). The animal had been in confinement and was very thin. A skull measures 6·5 inches in basal length, 4·2 in zygomatic breadth; length of upper sectorial 0·85.

Distribution. The Indian wild dog is found in Gilgit, Ladák, and other parts of the Upper Indus valley; it was obtained by Hodgson from Eastern Tibet, and it occurs throughout the Himalayan forests from Kashmir to Assam. It also inhabits all the larger forests of the Indian Peninsula, but I cannot find it recorded from Ceylon except by Jerdon, and he was perhaps misled by Hamilton Smith's *Chrysæus ceylanicus,* which appears to have been a domestic or semi-domestic dog. Kelaart distinctly denies the existence in Ceylon of the present animal.

It is doubtful whether the species found in the countries between Assam and Tenasserim is this or the next.

No Indian mammal has so remarkable a range as *C. dukhunensis.* Judging from other mammals, it might have been expected that the Tibetan and Himalayan species, *C. primævus* of Hodgson, would prove identical rather with the Siberian *C. alpinus,* Pallas, than with the Indian *C. dukhunensis.* But Scully has shown (P. Z. S. 1881, p. 202) that *C. alpinus* is distinguished by its much larger upper true molars, whilst no constant difference has hitherto been detected between *C. primævus* and *C. dukhunensis.*

Habits. The wild dog of the Indian Peninsula is a forest animal,

but in the Upper Indus valley and Tibet must inhabit open hilly country, as there is no forest. It is, as a rule, diurnal, but may move about by night also. It is thoroughly predatory, living, as a rule, on the animals killed by itself and the associated members of the same pack; but probably, like other canines, feeding upon carrion and on vegetable food at times. McMaster, to whom we are indebted for some very good notes on the species, found that an animal kept in confinement ate herbs, grass, and leaves of various kinds greedily, "not as dogs do when ill, but with a keen relish."

All forms of the genus *Cyon* hunt in packs, usually from six to twelve, but sometimes as many as twenty in number, and live principally upon deer of various kinds and wild pigs in India, and on wild sheep and antelopes in Tibet. Many sámbar and spotted deer are killed by them, whilst occasionally nilgai and Indian antelopes fall victims. Wild dogs avoid the neighbourhood of man, and consequently but rarely attack domestic animals; occasionally, however, they kill sheep, goats, and cattle, and Jerdon mentions one instance, and McMaster another, of their pulling down a tame buffalo. I came across a third case myself in the jungles east of Baroda, and I was curious to see how so large an animal had been destroyed. There were but a few tooth-marks about the nose and throat, and some of the pack had evidently attacked the buffalo in front, whilst others tore it open. This is probably their usual way of killing large animals; they have been seen to snap at the flank of a sámbar running.

The statement made by Hodgson, apparently on native information, that wild dogs give tongue when hunting is denied by the excellent observer and sportsman Colonel Hamilton, who wrote under the name of "Hawkeye," and who is quoted by McMaster. I have twice met with these animals in the act of hunting, once on the Nilgiris and a second time east of Raipur in Chhatisgarh, and in neither case did I hear any sound. They are said, however, to howl at night.

Throughout India there is a general belief that these wild dogs hunt and kill tigers. Whilst not absolutely rejecting the tale, I must say that I think it improbable. The wild dog drives away all deer and other wild animals on which tigers feed, and probably the latter follow their prey. At the same time, some of the accounts of wild dogs attacking tigers are singularly circumstantial. Captain Baldwin, in 'The Large and Small Game of Bengal' (p. 19), gives the particulars of one case, apparently as well authenticated as an account can be that rests upon the evidence of villagers inhabiting wild parts of the country. In this case the remains of a tiger that had been devoured were said to have been found together with three dead wild dogs. The same writer (p. 108) describes an instance, said to have been witnessed by an English sportsman, of an attack by wild dogs on the Himalayan

black bear (*Ursus torquatus*). Another case in which wild dogs are asserted to have killed a tiger is mentioned by Mr. Sterndale in 'Seonee' and in his 'Natural History of Indian Mammalia.' In other instances the wild dogs are said to have disputed with a tiger or a leopard the possession of prey that had been killed by the latter. It is not improbable that such disputes occur, that they result in the death of some of the wild dogs, and that the remains of the bullock or sámbar over which the contest has occurred are taken by credulous men for tiger's bones.

Another story about the wild dog, also universally believed in India, and quoted by Hodgson and others as if perfectly authentic, is that the urine of these animals is excessively acrid, that they sprinkle with it the bushes through which they drive their prey, and then rush upon the latter when blinded by the pungent fluid. Another version is that they jerk the urine into their victim's eyes with their tails. This is sometimes said to be their method of killing tigers, and in Burmah they are even supposed to destroy elephants by this stratagem. It is scarcely necessary to say that, except Hodgson, none of the naturalists (such as Jerdon, McMaster, and Sterndale) who mention this extraordinary story express any belief in it. A somewhat similar story (I suspect a myth) is told about wolves in Europe, and related by so good an observer as Blasius ('Säugethiere Deutschlands,' p. 182), to the effect that when large animals such as cattle or horses offer much resistance to wolves the latter dip their tails or the whole of their bodies in water, and either shake themselves before the animal they are attacking, or whisk their tails into his eyes and then rush on him in a body whilst his eyes are closed.

Although many large animals are killed by wild dogs, no instance appears to be known of their attacking man.

Wild dogs are said to be absolutely untamable, and, although this is perhaps an exaggeration, they are certainly very difficult to tame. In one instance mentioned by Hodgson there was a certain amount of domestication of a young individual, as it would play with dogs, and allow itself to be caressed by its owner, but others remained for years as fierce and shy as when caught, and this is the experience of all other writers.

The breeding-period is in the winter. The time of gestation is not accurately known, but is probably about two months; the young are produced in holes or caves among rocks from January to March, and there are sometimes six or more in a litter; but, according to Hodgson's observations, usually two to four. A breeding-place was discovered by Mr. Wilson near Simla, where several females apparently bred together.

71. **Cyon rutilans.** *The Malay wild Dog.*

? Canis javanicus, *Desm. Mamm.* p. 198 (1820).
Canis familiaris, *var.* sumatrensis, *Hardwicke, Trans. Linn. Soc.* xiii, p. 235, pl. xxiii (1822).
Canis rutilans, *S. Müll. Verhandelingen, Zool. Zoogd.* pp. 27, 51 (1839); *Blyth, Mam. Birds Burma*, p. 24.
Cuon primævus, *Cantor, J. A. S. B.* xv. p. 196, *nec Hodgson.*

Tau-khwe, Burm.; *Anjing-utan*, Malay.

Smaller and slighter in build than *C. dukhunensis*, limbs much more slender. The length of the upper sectorial is very little more than that of the two upper true molars. No woolly under-fur; hair of body short and harsh; brush smaller than in *C. dukhunensis.*

Colour. Uniform deep ferruginous red above, hair scarcely paler towards the base. Lower parts whitish. Terminal portion of tail black. (The original *C. javanicus* was said to be black on the back and outside of the limbs.)

Dimensions. Head and body $32\frac{1}{2}$ inches in a young male, tail 12; tarsus and hind foot in adults 6 inches. An adult female skull from Moulmein measures 5·9 inches in basal length, 3·5 in zygomatic breadth, length of upper sectorial 0·75.

Distribution. Throughout the Malay Peninsula, Sumatra, Java, and it is said Borneo. This is the species found in the Tenasserim provinces; and there is a specimen from Moulmein in the British Museum. Whether the form that inhabits Northern Burma is identical with this or the last species is not known.

Habits. Similar to those of *C. dukhunensis.*

Genus **VULPES**, Brisson, 1758.

Foxes, although frequently classed in the same genus with wolves and jackals, differ sufficiently to be entitled to generic distinction, being of slighter build with a longer tail, sharper muzzle, proportionally longer body and shorter limbs. The tail is always considerably more than half the length of the head and body, and is covered with long hair. The ears are large, the pupil of the eye vertically elliptical in a strong light, and there are 6 mammæ.

There is no frontal sinus in the skull, and the form of the anterior portion of the brain differs from that of *Canis* *. The upper surface of the postorbital processes is concave. The nasal bones do not extend so far back on the face as the maxillaries.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{2-2}{3-3}$, as in *Canis.*

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* Huxley, P. Z. S. 1880, p. 246.

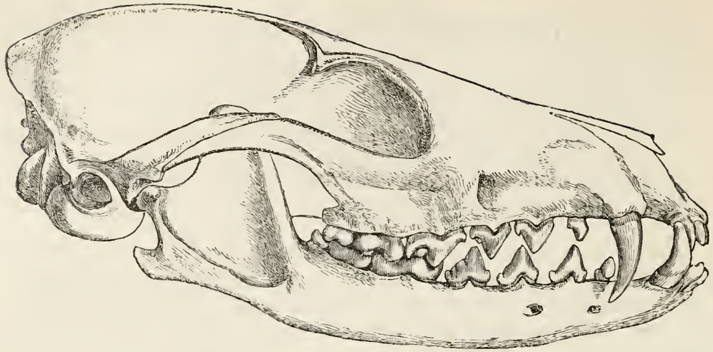

Fig. 37.—Skull of *Vulpes bengalensis.* (Gray, P. Z. S. 1868, p. 517.)

Synopsis of Indian Species.

A. Tip of tail black; ears grey outside.
- *a.* Rufous grey, small; skull about $4\frac{1}{4}$ inches long ... *V. bengalensis*, p. 148.
- *b.* Ashy grey, very small; skull about $3\frac{1}{2}$ inches long ... *V. cana*, p. 150.

B. Tip of tail white.
- *a.* Ears black or dull brown outside.
  - *a'.* Small; hind foot and tarsus 4 to 5 inches long ... *V. leucopus*, p. 151.
  - *b'.* Large; hind foot and tarsus about 6 inches long ... *V. alopex*, p. 153.
- *b.* Ears pale rufous outside; size small ... *V. ferrilatus*, p. 155.

Foxes are chiefly nocturnal in their habits, hiding in holes or burrows made by themselves, or in ravines or amongst grass or bushes during the day. They are, as a rule, solitary, and rarely if ever associate in numbers as other *Canidæ* do. All the species are more or less insectivorous and frugivorous; but the more tropical forms appear to live on insects more than those do that inhabit temperate climates. All are highly intelligent and famous for cunning.

72. **Vulpes bengalensis.** *The Indian Fox.*

Canis bengalensis, *Shaw, Gen. Zool.* i, p. 330 (1800); *Elliot, Mad. Journ. L. S.* x, p. 102.
Canis bengalensis (*and* C. rufescens?), *Gray, Hardwicke's Ill. Ind. Zool.* ii, pls. 2 & 3.
Canis kokree, *Sykes, P. Z. S.* 1831, p. 101.
Canis vulpes indicus, *Hodgson, As. Res.* xviii, pt. 2, p. 237 (1833).
Cynalopex bengalensis, *Blyth, Cat.* p. 41.
Vulpes bengalensis, *Horsfield, Cat.* p. 84; *Jerdon, Mam.* p. 149.
Vulpes hodgsonii, *Gray, Charlesworth's M. N. H.* i, p. 578.

Lúmri, Lōm, Lokri, H.; *Lukhariya* in Bundelkand; *Khekar, Khikir,* Behar; *Khek-siyal,* Beng.; *Kokri,* Mahr.; *Khekri,* Gond; *Konka-nakka, Gúnta-nakka, Poti-nara,* Tel.; *Konk, Kemp-nari, Chandak-nari,* Can.

Size small. Limbs very slender. Tail shorter in proportion than in typical foxes.

Colour. Above rufescent grey, varying with the season and locality from almost silver-grey to greyish rufous, minutely speckled with white, the sides very much greyer than the back; lower parts whitish, usually pure white on the chin and throat, pale rufous yellowish or creamy white on the lower breast and abdomen, and more rufescent towards the vent. No cross band on the shoulder. Dorsal fur sometimes white throughout, except at the tip, but when long, in the cold season, white at the extreme base, dusky or purplish slaty, with coarser white hairs intermixed, for about one quarter to one third the length, then creamy white or pale rufous but becoming darker gradually nearly to the end, where there is a white ring followed by a ferruginous or black tip. The fur on the lower parts is whitish throughout. The outer surfaces of the limbs are bright rufous; there is a black spot on each side of the muzzle in front of the eye; the ears are grey outside, whitish within. Tail grey, more or less rufescent above, many of the hairs with black tips, and those at the end of the tail entirely black, forming a sharply defined black tail-tip.

Dimensions. Head and body about 20 inches, tail without the hair at the end 11, with the hair 13 to 14, tarsus and hind foot about 4. A skull is 4·15 inches in basal length, 2·5 broad across the zygomatic arches; a smaller 4 by 2·25. Weight about 7 lbs. (males $7\frac{1}{4}$ to 8, females $5\frac{3}{4}$ to $6\frac{1}{4}$).

Distribution. Found commonly throughout India, except in thick forest, from the base of the Himalayas to Cape Comorin, but not recorded west of Sind and the Punjab, nor east of Assam, where it is rare. Unknown in Burma. Its occurrence in Ceylon is very doubtful; Kelaart mentions a report of its existence in the Badulla district, but evidently without placing any dependence on the story.

Habits. Jerdon's description of this animal's habits is excellent, and is confirmed and supplemented by McMaster's notes. This pretty little fox is familiar to many of the inhabitants of India, being common in most open parts of the country, whether cultivated or waste, and being by no means shy, but frequently coming into gardens and enclosures around houses. I have seen it on the Maidán in Calcutta, and its cry may be heard there almost nightly in the cold season. The sound, a little chattering bark, as Sterndale aptly calls it, consists of a sharp yelp quickly repeated three or four times.

The present species feeds less upon birds and more upon small mammals, reptiles, and insects than its larger allies. It but rarely carries off poultry. According to Sir Walter Elliot, it subsists mainly on rats, land-crabs, grasshoppers, and beetles; but Jerdon has seen it hunting quail, and says that it doubtless kills young birds and eats eggs. He also remarks that lizards are a favourite food with it, that it habitually eats fruit, such as ber (*Zizyphus*), melons, &c., and occasionally pods and shoots of gram or channa

(*Cicer arietinum*) and other vegetables; whilst both he and McMaster have observed it feeding on termites or white ants, especially the winged forms that emerge in flights in the hot season. McMaster relates having once near Hyderabad, in the Deccan, seen a fox spring out of the grass and catch moth after moth as they passed him just before dusk.

The burrows in which the Indian fox lives and breeds are usually situated in open plains, sometimes in thorny scrub, a slight rise in the ground, the bund of a tank or other artificial elevation being selected in places liable to be flooded in the rainy season. There are several openings to each burrow, some of them blind, others leading to a larger central chamber, two or three feet below the surface. Jerdon relates that on two occasions he ran foxes to holes in hollow trees.

The Indian fox does not exhale the strong odour characteristic of the European species, and is said to afford but little scent to dogs. *V. bengalensis* is but rarely hunted with foxhounds, partly on this account, partly because of its numerous earths. It, however, is frequently coursed with greyhounds, and gives a good run with Arab, Persian, or half English dogs, pure-bred English hounds being too fast. It doubles in a most dexterous manner, taking advantage of every accident of the ground, such as a ditch or ravine, and frequently making good its escape to earth or into bushes. McMaster, who writes enthusiastically about this game little animal, says he was once beaten by a tired fox, that escaped the dogs by running amongst a herd of sheep and cattle.

In its movements this animal is quick, active and graceful. Jerdon notices that the tail is carried trailing when the fox is going slowly or hunting for food, horizontal when running, and almost erect when making a sudden turn.

This fox is easily tamed and is said to be an amusing pet, free from smell and cleanly it its habits. It is not often kept tame as it is believed to be liable to attacks of rabies. There is, however, some probability that such cases as have occurred, if not caused by infection, may have been due to too close confinement.

The breeding takes place in burrows. The pairing-time varies according to locality from November to January, and the young, almost always four in number, are produced from February to April. At this season the female is seldom to be met with after sunrise, and the cubs are very rarely seen outside their earth till nearly full-grown.

73. **Vulpes cana.** *The hoary Fox.*

Vulpes canus, *W. Blanford, J. A. S. B.* xlvi, pt. 2, p. 321 (1877); *Sclater, P. Z. S.* 1878, p. 392.

Poh, Baluch.; *Kúrba-shákál* (cat-jackal), Persian of Kandahár.

Size very small; tail long and bushy; fur long and very soft. Skull (in the only specimen examined) destitute of any sagittal

crest. Muzzle short and narrow. The inner lobe of the upper sectorial tooth very small.

Colour. Ashy grey, blackish on the back and sometimes with a rufescent tinge, white below. The basal half of the dorsal fur is dark purplish grey in some skins, the distal half grey or rufescent; in other cases the hairs are light ashy grey almost throughout, the longer and coarser hairs have white rings near the end, and black tips on the back. The long tail-hairs are ashy near the base, white near the ends, the tips black, the black tips being more developed posteriorly so that the tail has a black tip, though less defined than in *V. bengalensis.* Ears grey outside, creamy white on the margin and within; forehead rufous; a dusky or black spot on each side of the muzzle. Outside of the limbs dark rufous or dark ashy, almost black in some cases.

Dimensions. Head and body 18 inches, tail with the hair at the end 15 to 16, without 12½ to 13. In the skull the basal length is 3·35, zygomatic breadth 2.

Distribution. Baluchistan and Southern Afghanistan, possibly extending eastwards to Sind. I have hitherto only been able to examine two skins and a skeleton, the types, procured by Major Mockler at Gwádar, and a skin from Kandahar sent to me by Sir O. B. St. John.

Nothing is known of the habits of this species.

74. **Vulpes leucopus.** *The Indian desert Fox.*

Vulpes flavescens, *Blyth, J. A. S. B.* xxii, p. 581, *nec Gray.*
Vulpes leucopus, *Blyth, J. A. S. B.* xxiii, p. 729 (1854), xxv, p. 443, xxvi, p. 239; *Jerdon, Mam.* p. 151.
Vulpes griffithii, *Blyth, J. A. S. B.* xxiii, p. 730; *id. Cat.* p. 43; *Scully, A. M. N. H.* ser. 5, viii, p. 226.
Vulpes pusillus, *Blyth, J. A. S. B.* xxiii, pp. 729, 730; *Adams, P. Z. S.* 1858, p. 516; *Jerdon, Mam.* p. 153.

Lúmri or *Lokri,* H. and Sindhi; *Lombar,* Baluchi; *Rubah,* P.

Size small, though rather larger than that of *V. bengalensis.* Fur full in winter.

Colour of typical form. In winter the back is more or less rufous, speckled with white, and varies from brownish yellow to rusty red. There is usually a distinct pale patch on each side of the back behind the shoulder, and the cross stripe in front of these patches is well marked. The sides are grey or whitish, more or less speckled, becoming darker, often iron-grey or simply rufous, on the outside of the limbs. The lower parts as a rule are slaty or purplish grey to blackish, abdomen paler, chin and generally a spot in the middle of the breast white. The underfur on the back purplish brown throughout the basal half to three quarters, the extreme base being sometimes whitish, median portion rufous, then white for some distance, and the tip red. On the sides the hairs are white throughout, except a few which have blackish tips. On the underparts the fur is purplish brown, paler towards the base,

and with more or less developed white tips. The ears are black or dark brown outside except near the base, whitish within and on the edges. Face rufous, especially round the eye; usually a dark spot in front of each eye. The inside of the fore limbs, and especially the whole anterior surface of the hind limbs to the toes whitish or white, hence the name. Tail above the same colour as the back, less rufous on the sides and below, many of the hairs with dusky tips; terminal portion of tail pure white.

In spring, when the hair is worn, the dark underfur is exposed on the back, and the whole animal is greyer. The lower parts are probably white in summer.

Dimensions. Head and body 19 to 22 inches, tail with hair at the end 12 to 16, without 11 to 14, ear outside 3 to 3·5, tarsus and hind foot 4 to 4½. An average-sized female skull is 4·2 inches long (basal length) and 2·4 broad; a large male skull 4·45 by 2·65. Weight about the same as that of *V. bengalensis*, or rather more; the specimen of which Jerdon gives the weight as 5½ lbs. was probably small.

Varieties. I am inclined to class together the three forms distinguished by Blyth because, after seeing a great many specimens of *V. leucopus* from Sind and Rájputána, I am unable to find any characters by which the small Afghan fox, *V. griffithi*, and the Punjab fox, *V. pusilla*, can be distinguished. Both are probably, as a rule, rather larger, but the difference is trifling; and a skull of *V. griffithi* from Kandahar, in the British Museum, measures 4·3 inches in basal length, and is of the same size as a rather large skull of *V. leucopus* from Rájputána. I am indebted to Mr. Theobald for two specimens of a fox, which I believe is typical *V. pusilla*, from the Potwár in the northern Punjab, and except a trifling difference in size, both agree perfectly with skins of *V. leucopus* from Sind, whilst they are the same size as large specimens of *V. leucopus* from Rájputána.

There is some confusion as to *V. griffithi*, for whilst it is founded on the smaller fox of Afghanistan, the dimensions given by Hutton (J. A. S. B. xiv, p. 344),—head and body 2 feet, tail 17 inches, height at shoulder 14 to 15—agree better with the larger form.

The species described by me in 1875 (A. M. N. H. ser. 4, xvi, p. 310, and 'Eastern Persia,' ii, p. 39) as *V. persica* is possibly identical with *V. leucopus*, though larger.

Distribution. *V. leucopus* inhabits the dry and semi-desert regions of Western India, Sind, Cutch, Rájputána, the Punjab, and the North-west Provinces as far east as Fatigarh. It is also found in Baluchistan and Afghanistan, and seems widely distributed in South-western Asia, as I have specimens from Muscat in Arabia.

Habits. This is essentially a desert animal, and in India keeps much to sandy wastes, where it appears to live chiefly on the sand-rats, *Gerbillus hurrianæ*. Jerdon remarks that the present species keeps to a different kind of ground from that inhabited by *V. bengalensis*, but in Sind both are common on the waste land with scattered bushes that covers so large a portion of the province.

V. leucopus, however, appears to be the only form actually found amongst the sand-hills of the desert. The habits, so far as they are known, exhibit no peculiarity. Jerdon considers this fox more speedy than *V. bengalensis* and capable of giving a capital run even with English greyhounds.

75. **Vulpes alopex.** *The common Fox.*

Canis vulpes *and* C. alopex, *Linn. Syst. Nat.* i, p. 59 (1766).
Canis vulpes montana, *Pearson, J. A. S. B.* v, p. 313 (1836).
Canis himalaicus, *Ogilby, P. Z. S.* 1836, p. 103.
Vulpes nipalensis, *Gray, Charlesworth's Mag. N. H.* i, p. 578 (1838).
Vulpes montanus, *Blyth, J. A. S. B.* xi, p. 589, xxiii, p. 730; *Adams, P. Z. S.* 1858, p. 516; *Jerdon, Mam. Ind.* p. 152; *Blanf. J. A. S. B.* xlvi, p. 323, xlviii, p. 95; *Scully, P. Z. S.* 1881, p. 202; *id. A. M. N. H.* ser. 5, viii, p. 225.
Vulpes flavescens, *Gray, A. M. N. H.* (1) xi, p. 118 (1843); *Hutton, J. A. S. B.* xiv, p. 344; *Adams, P. Z. S.* 1858, p. 516; *Blyth, Cat.* p. 42; *Blanford, Yark. Miss., Mam.* p. 22, pl. ii.
Vulpes alopex, *Blanford, P. Z. S.* 1887, p. 635.

Lomri, H.; *Rubah*, Pers.; *Luh* ♂, *Laash* ♀, Kashmiri; *Wamu*, Nepal.

A large, and, in winter, richly-coloured fox with long fur and a superb brush. The skull is elongate, but the muzzle is less narrow proportionally than in the smaller Indian forms.

Colour of the Himalayan variety. Middle of the back varying from pure chestnut to dull rufous, speckled with white or yellow, or to dark iron-grey (black and rufous mixed). The cross stripe on the shoulder sometimes scarcely apparent, in other skins very distinct and with well-marked buff patches on each side before and behind. The hinder part of the back and the thighs much greyer and more speckled with white; the sides paler in colour; lower parts varying from creamy-white to almost black, being probably much paler in summer than in winter. There is generally a white spot in the middle of the chest, which, with the throat, is often much darker than the belly, or the dusky portion of the latter may be confined to a median band. The woolly underfur on the back purplish brown; terminal portion of longer hairs rusty-red, with generally a white or whitish ring near the end, the extreme tip often black. The underfur of other parts of the body varies from yellowish white to dusky. The ears are black outside, light rufous or buff within. The face is rufous; there is a large black spot in front of the eye, and the cheeks are white. The outside of the limbs are ferruginous, black and white mixed, sometimes one colour prevailing, sometimes the other. Tail greyish, more or less rufous, many of the hairs with black tips, but the end of the tail is conspicuously white.

In spring, when the long winter fur is shed, the animal can scarcely be recognized; the dark underfur gives a greyish-brown tinge to the back, whilst the sides are pale and the lower parts whitish.

Dimensions of Himalayan specimens. Length of head and body 24 to 25 inches, tail with hair at the end 18 to 20, without $14\frac{1}{2}$ to 17, tarsus and hind foot nearly 6, height 14 to 15 inches; weight (according to Jerdon) 14 lbs. A Himalayan skull measures 4·9 inches in basal length by 2·7 broad.

Varieties. There is a considerable amount of variation, both in size and colour, exhibited by the different races of the common fox, and there is, as yet, much difference of opinion amongst naturalists as to whether these different races should be distinguished by specific names. The fox of Northern and Central Europe is rather larger than the Himalayan fox and much redder; but the variety inhabiting Southern Europe, *Canis melanogaster* of Bonaparte, approaches more nearly in colour to the Himalayan race. The large Central-Asian fox, *V. flavescens*, Gray, is a paler-coloured and yellower animal as a rule, with very thick fur in winter and a superb brush. It occurs within our limits in Ladák and other parts of Western Tibet, and is found throughout Eastern Tibet and in some of the higher Himalayan valleys south of the main range; also in Eastern Turkestan, Northern Persia, and probably in other parts of Central Asia. It is also, I believe, the form found in Afghanistan. I have not been able to examine any series of skulls from other localities, but those from Eastern Turkestan are larger than Himalayan specimens (one of a female measures 5·45 inches long and 3·15 broad), and equal in size to those of the European fox, whilst the teeth are larger even than in the latter. But it is extremely doubtful if these characters are constant, for there is much variation amongst European foxes. It appears to me that all the large Palæarctic red foxes, together with the North-American cross-fox, *C. fulvus* or *pennsylvanicus*, must be considered varieties or races of one species.

Distribution. Of these races two are found within the limits of the Indian fauna—*V. alopex* var. *montana* of the Western Himalayas, which is described above and is found from Nepal to Kashmir and Gilgit; and *V. alopex* var. *flavescens*, the paler, rather larger Central-Asiatic form, occurring in the higher Himalayas, in Tibet, and probably in Afghanistan. No foxes are known to occur in Sikhim or the Eastern Himalayas except close to the snows, and it is doubtful whether any are found in Nepal. Hodgson's specimens were from Simla. Beyond Indian limits the species is found throughout the greater part of the Palæarctic and (if the views above expressed be correct) Nearctic regions.

Habits. The Himalayan fox lives in brushwood and cultivated land, from an elevation of 5000 or 6000 feet upwards, frequently haunting the neighbourhood of human habitations and feeding upon such birds and small mammals as he can capture. He is very destructive to partridges, pheasants, and other game-birds, and often carries off poultry. In Europe, wherever rabbits are common, foxes live chiefly upon them. The Central-Asiatic variety lives in open country, hiding in burrows or amongst bushes or rocks by day. Like all other foxes, this species, besides killing

birds and small mammals, feeds upon insects of various kinds, on the combs and honey of wild bees, on eggs, and on fruits and berries, and is especially fond of grapes. Occasionally it eats carrion. In winter, Captain Hutton says, when the snow is on the ground, these animals are very numerous about Simla, and come close to the houses in search of offal and other food.

Foxes generally live and breed in burrows, but sometimes in holes amongst rocks. The breeding-time is at the end of winter; the period of gestation 9 weeks; the young, usually five to seven in number (in the Himalayas, it is stated by Hutton, only three or four), are produced about the end of March or in April; they are born blind, and remain so for a fortnight. They are full-grown in the autumn, and sometimes breed again the first year. Foxes live thirteen or fourteen years.

In Kashmir Jerdon mentions that in 1865 the 7th Hussars had a pack of hounds and killed many foxes. There are, however, but few localities where the Himalayan fox can be hunted.

76. **Vulpes ferrilatus.** *The small Tibetan Fox.*

Vulpes ferrilatus, *Hodgson, J. A. S. B.* xi, p. 278, pl.
Cynalopex ferrilatus, *Blyth, Cat. Mam.* p. 41.

Igur, Tibetan.

Size considerably less than that of *V. alopex*. Ears short; brush well developed; fur long, especially on the legs and feet.

Colour. On the back ochraceous, finely speckled with white, the general tint being a pale yellowish rusty; face and outside of ears similar, but rather greyer and less yellow; sides of the neck, breast, and body, and the greater part of the tail nearly pure grey, mixed black and white; tip of the tail white; outside of the limbs yellowish rufous; lower parts white, the middle of the breast conspicuously white and distinct from the dark grey sides. Dorsal fur light grey at the base, then pale rufous, becoming darker near the end, the tips of the longer hairs white, black tips being intermixed, rarely on the back but abundantly on the sides, and especially on the tail except towards the tip. Vibrissæ black.

Dimensions. None are available from fresh specimens. In a skin the head and body measure $24\frac{1}{2}$ inches, tail without the terminal hairs $9\frac{1}{2}$, with the hairs 11, ear outside 2 inches. According to Hodgson, a skull not mature was $4\frac{5}{8}$ inches long and $2\frac{1}{2}$ broad.

Distribution. Tibet, around Lhassa. Stoliczka (J. A. S. B. xxxvii, pt. 2, p. 5) includes this fox among the animals found in the Upper Sutlej valley, but the species does not appear hitherto to have been observed elsewhere within British limits. Its habits are unknown.

ARCTOIDEA.

Family MUSTELIDÆ.

The first family in the third of the great groups into which the typical Carnivora have been divided contains the martens and weasels, the badgers and the otters, an assemblage of animals varying more in external conformation, and also in the characters of the teeth, than is the case in any other family of Carnivora. All agree in the possession of a single upper true molar on each side, and all have two lower molars in each ramus of the mandible except *Mellivora*, which has but one. The number of premolars is variable, and even that of the incisors is not constant. There is no alisphenoid canal. Several genera possess the power of diffusing at will from their anal glands an excessively fœtid fluid. Five toes occur on all feet.

The *Mustelidæ* are somewhat difficult of arrangement when all the genera are taken into consideration; but the Indian forms fall easily and naturally into the three subfamilies amongst which the types belonging to the family have been distributed. These subfamilies are readily distinguished by the characters of the feet and claws.

A. Toes short, partially webbed; claws short, compressed, acute, curved, often semirectractile. Upper posterior molar of moderate size, elongate transversely. Terrestrial and arboreal........ *Mustelinæ.*

B. Foot elongated; toes straight; claws non-retractile, slightly curved, non-compressed, blunt, those of the fore feet especially large. Upper posterior molar variable. Habits mostly terrestrial and fossorial .... *Melinæ.*

C. Feet short, rounded; toes webbed; claws small, curved, blunt. Head broad and much depressed. Upper posterior molar large and quadrate. Habits aquatic............................ *Lutrinæ.*

The above arrangement is identical with Blyth's in his 'Catalogue of the Mammalia in the Museum of the Asiatic Society,' but Jerdon classed the badgers and their allies in a distinct family apart from the weasels and otters.

Throughout the *Mustelidæ* the form of the skull changes with age, even more than in other Carnivora. The breadth across the zygomatic arches increases, whilst the width of the skull between the orbits diminishes to an extraordinary degree. The sagittal and occipital crests increase long after the animal is fully adult. There is also in many forms a great sexual difference in size. A remarkable example is described by Mr. Thomas (P. Z. S. 1886, p. 125).

Subfamily MUSTELINÆ.

The Indian genera of this subfamily are typical forms with a long body and short limbs. The majority of the subfamily are found in the Northern regions of both continents; several occur in the Himalayas, but only one species is known to exist in the Indian Peninsula and in Burma. Two genera are found within Indian limits.

Teeth in molar series on each side 5 above, 6 below. Lower sectorial with inner tubercle. Size about that of a domestic cat	MUSTELA.
Teeth in molar series 4 above, 5 below. No inner tubercle to lower sectorial. Size small	PUTORIUS.

By most English naturalists the name *Martes* is used for the martens (*Mustela*), and *Mustela* for weasels and polecats. I have given elsewhere (P. Z. S. 1887, p. 636) my reasons for preferring the nomenclature of French and German writers.

Genus **MUSTELA**, Linn., 1766.

Syn. *Martes*, Nilsson.

Body long and slender; limbs short; tail of considerable length. Feet digitigrade or nearly so; toes short; claws compressed, curved, sharp, semiretractile.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{1-1}{2-2}$. Upper sectorial with

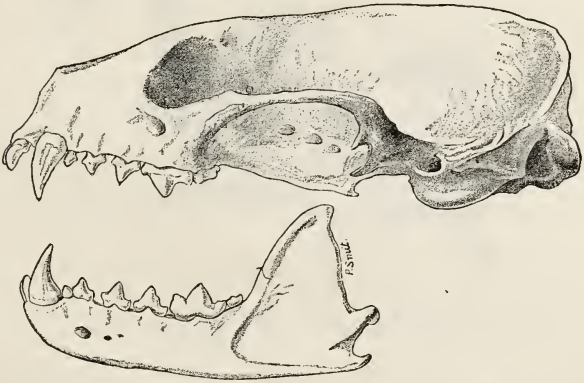

Fig. 38.—Skull of *Mustela flavigula*.

the inner lobe close to the anterior end. Upper true molar nearly the same size as the sectorial. Lower sectorial with small inner tubercle. Vertebræ: C. 7, D. 14–15, L. 5–6, S. 3, C. 18–24.

The martens are animals about the size of a domestic cat, more or less arboreal in their habits, and with but little, if any, disagreeable scent.

Synopsis of Indian and Burmese Species.

A. Tail without hair three fourths the length of the head and body .... *M. flavigula*, p. 158.
B. Tail without hair one half the length of the head and body.......................... *M. foina*, p. 160.

A trace of a fossil *Mustela* has been found in the Siwalik beds. From the fragments found, the species appears to have been similar to *M. flavigula*.

77. **Mustela flavigula.** *The Indian Marten.*

Mustela flavigula, *Bodd. Elench. An.* p. 88 (1785); *Cantor, J. A. S. B.* xv, p. 194.
Martes flavigula, *Blyth, J. A. S. B.* xxvi, p. 316; *id. P. Z. S.* 1864, p. 485; *id. Mam. Birds Burma*, p. 29; *Adams, P. Z. S.* 1858, p. 516; *Jerdon, Mam.* p. 82; *Blanf. J. A. S. B.* xlvii, pt. 2, p. 156.
Galidictis chrysogaster, *Jardine, Nat. Lib.* xiii, p. 167, pl. vii (1842).
Martes gwatkinsi, *Horsfield, Cat.* p. 99 (1851).

Kasia, Sirmur; *Tuturala, Chitrála*, Kumaon and Garhwal; *Múl sampra*, Nepal; *Huniah*, Bhot.; *Sakku*, Lepcha; *Anga Prao*, Malay.

Fig. 39.—*Mustela flavigula.* (From Hodgson's drawings.)

Tail long and bushy, measuring, without hair, quite three quarters the length of the head and body. Caudal vertebræ 24. Feet more or less naked beneath; in Malay specimens the whole metacarpus and more than half the tarsus being bare, whilst in some Himalayan animals the naked soles appear less developed. Short hairs separate the pads from each other and from the central

pad. Fur of body short in Malay skins, moderately long in Himalayan specimens, and with woolly underfur in winter.

The skull resembles that of *M. foina* more than that of *M. martes* in shape, but is larger than either, the zygomatic breadth exceeds half the length, and the sides of the muzzle converge. The length of the upper sectorial along its outer margin exceeds the breadth of the upper true (hindmost) molar. This molar differs in form from that in *M. foina* and *M. martes* by having the inner lobe no broader from back to front than the outer.

Colour. In the common Indian form the head to below the ears, with the face, nape, and more or less of the hind neck, the rump, tail, and limbs glossy blackish brown to black, the back from the shoulders to the rump pale brown, sometimes brownish white. The chin and upper part of the throat as far as below the ears white; throat and breast yellow or orange or brownish yellow; abdomen similar in colour to the back, but a little paler. The underfur on the back is paler in colour than the terminal portions of the longer hairs.

Varieties. There is, however, a much darker form, found both in the Himalayas and in Southern India, the *Galidictis chrysogaster* of Jardine and *Martes gwatkinsi* of Horsfield. The whole animal is dark brown, except the chin, throat, and breast, the two former of which are white, the breast pale yellow. According to Adams, the dark phase is the summer livery, but this requires confirmation. Another variety, found in Southern Tenasserim and the Malay countries, has the head above and the back uniform or nearly so in colour, a moderate hair-brown, not nearly so dark as the head in ordinary specimens, but with a darker band on each side of the nape, forming a margin to the paler throat, which is not always white or yellow, but sometimes, with the breast, light brown. The Malayan race, however, is not, as Jerdon states, paler than others, but the reverse, except on the head. There is, in the British Museum, a blackish-headed specimen from Tavoy, with the back very pale light yellowish brown, this colour extending to the base of the tail. Four different varieties are described by Blyth, one from Southern India being very similar in colour to some Malay specimens, brown throughout, paler on the sides, chin, throat, and breast. In some instances dark brown spots are found on the throat or breast.

Dimensions. Head and body 20 to 22 inches, tail without hair about 16, with hair 17 to 20 (Jerdon's measurement of the tail is erroneous). Weight 4 to $6\frac{3}{4}$ lbs. Basal length of skull 3·53 inches, zygomatic breadth 2·3 inches.

Distribution. Throughout the Himalayas from west of Kashmir (I have a skin from Hazára collected by Mr. A. B. Wynne) to the eastern extremity of Assam, at elevations not exceeding 7000 to 8000 feet, also throughout the hilly part of Burma, the Malay Peninsula, and Sumatra. *M. flavigula* is also found in Southern China and even in Amurland (*Radde*). In the Peninsula of India this marten is found on the Nilgiri hills, on the Travancore ranges,

and probably on some of the other higher portions of the Western Ghats, but it does not appear to have been recorded in this range north of the Nilgiris. Jerdon says it is found in Ceylon, but I cannot find any notice of its occurrence there.

Habits. The Indian marten lives in hill-forests, and is not unfrequently seen in the daytime, sometimes in pairs, occasionally in families of five or six, hunting among brushwood or on the branches of trees. "When moving about, it is constantly uttering a low chuckle, which is prolonged into a harsh cry when the animal is excited" (*Adams*). It lives upon birds and their eggs and small mammals, and it is said to kill young deer. It also feeds on reptiles and fruits, and probably on insects, one having been shot by Mr. Bourdillon on a tree in the Travancore hills, apparently in the act of feeding upon cicadas.

This species is said to be easily tamed. Nothing is recorded about its breeding-habits, which probably resemble those of other members of the genus. It has a very slight unpleasant odour.

78. **Mustela foina.** *The beech Marten.*

Mustela foina, *Erxleben, Syst. Regn. An.* p. 458 (1777).
Martes foina, *Nilsson, Faun. Scand.* i, p. 38 (1820); *Alston, P. Z. S.* 1879, p. 469; *Scully, P. Z. S.* 1881, p. 202; *id. A. M. N. H.* (5) viii, p. 96.
Martes toufæus, *Blyth, J. A. S. B.* xvi, p. 353, partim; *id. Cat.* p. 66, *nec Hodgson.*
Martes abietum, *Horsf. Cat.* p. 101; *Adams, P. Z. S.* 1858, p. 517, *nec Ray.*
Martes leucolachnæa, *W. Blanford, Yark. Miss., Mam.* p. 26.

Dalla kafak, Afghanistan.

Tail covered with long hair, and measuring without the hair about half the length of the head and body. Caudal vertebræ about 21. Feet with long hair between the toes, so that the naked pads are much concealed, especially in winter, when the hair is much longer. Body covered in winter with long glossy hair and thick soft woolly underfur. Skull broad, muzzle short with the sides slightly converging. Length of upper sectorial along the outer edge greater than breadth of upper true molar. The inner lobe of the last tooth, the hindmost in the upper jaw, is a very little broader from front to back than the outer lobe, the outer margin of the latter distinctly indented between the two cusps.

Colour. Varying from greyish brown or even whitish brown or brownish grey to deep blackish brown, the tail and limbs usually rather darker than the body; throat and breast white, the extent of the white varying. The underfur varies from ashy to pure white.

In general the fur of this species is inferior to that of the pine-marten, *M. martes*; but some Afghan and Turkestan skins of *M. foina* have beautiful fur, with long, glossy, nearly black piles and

very soft white or pale ashy underfur. This is the variety for which I proposed the name *leucolachnœa.*

Dimensions. Head and body 18 inches, tail without hair 10, with hair 13. Basal length of skull 2·85, zygomatic breadth 1·8.

Distribution. Throughout the greater part of Europe, but not in the extreme north, and in Western Asia. This marten occurs in Afghanistan and probably throughout the greater part of the Himalaya at considerable elevations ; specimens have been recorded from Gilgit, Ladák, and Kumaon, and I possess one procured by the late Mr. Mandelli from Upper Sikhim or the neighbouring portion of Tibet. The species has not been found further east.

Habits. Nothing has been recorded of the habits of *M. foina* in the Himalayas, except that Scully states, in Gilgit, that it keeps to considerable elevations and is but rarely found in the vicinity of villages as low as 5000 feet. In Europe it is more common than the pine-marten, though the latter, as Alston has shown, is the only form occurring in Britain. The beech-marten is bolder than the pine-marten and more often found about human habitations ; it lives in trees or amongst rocks, and feeds chiefly upon birds or small mammals, frequently destroying poultry. It is very bloodthirsty, killing more than it requires for food. When pressed by hunger it will eat lizards, snakes, frogs, or fruit, and is said to be very fond of cherries. The pairing-time is about February, the period of gestation 9 weeks, the number of young usually 4 or 5, and they remain blind for 14 days from their birth. Young individuals are easily tamed, and indeed there is good reason for believing that the animal was domesticated by the Greeks and Romans and kept for the same uses as cats are now (see Rolleston, Journ. Anat. Phys. 1868, ii, p. 47).

Martes? toufœus of Hodgson (J. A. S. B. xi, p. 281) was founded upon three furrier's skins that had been brought from Tibet, without skull, tail, or feet. These skins are now in the British Museum and have been labelled *M. zibellina*, the sable, to which they may perhaps belong. The fur is very soft, the underfur brownish, not at all like that of *M. foina.* They are very different from the specimens identified with *M. toufœus* by Blyth.

Mustela martes (*Martes abietum* of many English writers), the pine-marten, is easily distinguished from *M. foina* by its narrower skull and differently shaped upper sectorial and true molar (see Alston, P. Z. S. 1879, p. 469). The sable appears to represent the pine-marten in Eastern Asia, and is by some considered only a variety of the latter.

Genus PUTORIUS, Cuv. 1817.

Syn. *Mustela,* auct. nec Cuvier.

Body very long, slender, and typically vermiform, limbs very short, tail variable. The external characters are similar to those of *Mustela*, except that the body, in the typical weasels especially, is even more elongate.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{3-3}$, m. $\frac{1-1}{2-2}$. The principal difference from the martens consists in the absence of the anterior premolar in both jaws, in the cusps of the teeth being sharper, and in the absence of the inner tubercle from the lower sectorial. The skull is elongate behind the orbits, but the muzzle is short. Vertebræ C. 7, D. 14–15, L. 5–6, S. 3, C. 15–21.

Fig. 40.—Skull of *Putorius canigula.*

The forms comprised are the animals known as weasels, polecats, ferrets, and minks, of which many species occur in the northern parts of both hemispheres, and several inhabit the Himalayas, one at least extending to the hills south of the Assam valley, and another, not hitherto recorded within Indian limits, inhabiting the Malay Peninsula. None are found in the Peninsula of India.

All the species are thoroughly carnivorous and excessively sanguinary and bold, killing, if an opportunity offers, far more than they can consume, and destroying animals much larger than themselves.

Synopsis of Indian Species.

A. Limbs and lower surface darker than upper parts. (Polecats.)
- *a.* Back fulvous, longer hairs black-tipped *P. larvatus,* p. 163.
- *b.* Back variegated with white and dark brown .... *P. sarmaticus,* p. 164.

B. Lower surface not darker. (Weasels.)
- *a.* Tail-tip dusky or black.
  - *a'.* Lower parts white; whole body white in winter .... *P. erminea,* p. 165.
  - *b'.* Lower parts brown .... *P. subhemachalanus,* p. 166.

b. Tail-tip not darker.
  a'. A pale median dorsal stripe ...... *P. strigidorsus*, p. 170.
  b'. No dorsal stripe.
    a''. Nose white .... *P. canigula*, p. 167.
    b''. Nose the same colour as forehead.
      a. Back dark reddish brown .... *P. cathia*, p. 169.
      β. Back light brown .... *P. alpinus*, p. 168.

79. Putorius larvatus. *The Tibetan Polecat.*

Putorius larvatus, *Hodgs. J. A. S. B.* xviii, p. 447, pls. xi, xii (1849).
Putorius tibetanus, *Horsfield, Cat.* p. 105.

Tail without hair less than half the length of the head and body. Fur long, with much woolly underfur. Long hair between the toes greatly concealing the naked toe-pads. Metatarsus thickly furred. Claws sharp.

The skull figured by Hodgson, the only one of the Tibetan form known, is immature, the sutures being all open, although the dentition is adult. The hamular process of each pterygoid bone, which in *P. fœtidus*, the common European polecat, is much curved outwards, in the skull of *P. larvatus* is but slightly curved, and is in contact with a process projecting forwards from the anterior portion of the bulla, as in *P. sarmaticus*. The upper true molar is dumbbell-shaped, the inner lobe being broader than the outer.

Colour. Above dirty whitish or fulvous with a black wash, especially between the shoulders and on the hinder part of the back, owing to the long black tips on some of the longer hairs. Underfur whitish throughout. Part of the face between the eyes brown (perhaps black or blackish, as described by Hodgson, in fresh specimens), the tip of the nose and the chin white. The throat, breast, all the limbs, the groin, and the tail except near the base blackish brown, abdomen whitish.

Dimensions. Hodgson gives the following:—head and body 14 to 16 inches, tail with hair at the end 7, without 6, planta with nails $2\frac{3}{8}$ (in another $3\frac{1}{2}$).

Distribution. A specimen was procured by Captain (now General) Strachey in Ladák, others by Hodgson from the Utsang district of Tibet north of Sikhim.

Habits. Probably precisely the same as those of the common European polecat, which is particularly distinguished amongst the weasel tribe for the evil odour generated by the secretion of its anal glands, whence its name of foumart or foul marten. It lives in woods and thickets, often near human habitations. *P. larvatus* probably inhabits a less wooded country and hides, like many other species of martens and weasels, amongst stones. The common polecat is very sanguinary and bold, and singularly destructive to game and poultry: it also feeds on frogs and toads. The period of gestation is about 9 weeks, the young, usually 5 to 7 in number, are born about April, in hollow trees or amongst rocks or stones.

The common ferret is a domesticated variety of the polecat.

Externally *P. larvatus* closely resembles *P. eversmanni* (Lesson, Man. Mam. p. 144) of Western and Northern Asia in form and coloration, but in none of the three skulls of that species in the British Museum is there a process connecting the pterygoid bone with the bulla. The form of the upper true molar, too, appears to me different. *P. putorinus* (Blyth, J. A. S. B. xi, p. 281, note) is evidently the same as *P. eversmanni*.

80. **Putorius sarmaticus.** *The mottled Polecat.*

Mustela sarmatica, *Pallas, Reise*, i, p. 453 (1771); *Hutton, J. A. S. B.* xiv, p. 346; *Blyth, Cat.* p. 68; *Scully, A. M. N. H.* ser. 5, viii, p. 227.

Tail bushy, about half the length of the head and body. Fur shorter and more even than in the common or Tibetan polecats. Very little woolly underfur, the longer hairs coarse and glossy.

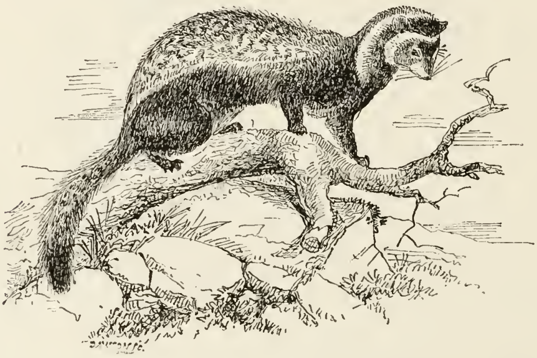

Fig. 41.—*Putorius sarmaticus.*

Skull similar in form to that of the common polecat, not pinched in behind the postorbital processes. The hamular process of the pterygoid on each side is nearly straight, and meets a process running forward from the anterior portion of the bulla, leaving a foramen below, which is nearly or quite filled up in old skulls, so that the mesopterygoid fossa is continued back to between the bullæ. Crowns of upper true molars not dumbbell-shaped, but of approximately the same width from front to back throughout.

Colour. Upper parts variegated with brown and yellowish white, underfur on the back greyish brown. Lower parts from the chin, with the limbs, glossy black. Face dark brown to black, except a white band across the forehead. Another band passes across the nape, and includes the upper portion of the ears; the two bands nearly or quite meet below the ears. Hind neck dark brown; there is generally a broad fairly marked whitish band behind each shoulder. The hairs on the tail are very pale brown at the base, then dark

brown; the terminal portion white, except at the end of the tail where all the tips of the hairs are black.

Dimensions. Head and body 13 inches, tail without hair $6\frac{1}{4}$; weight 8 to 12 ounces. Skull (of a female) 2·05 long (basal length), 1·3 broad across the zygomatic arches.

Distribution. Eastern Europe and parts of Western Asia, generally very rare, but common in South Afghanistan about Kandahar and Quetta. It has been obtained at or near the latter locality by Captain Hutton and Dr. Leith, and, as I learn from Sir O. B. St. John, occurs in Pishin, north of Quetta.

Habits. An excellent account of this animal is given by Hutton, very little about it having been recorded in Europe. It lives in the ground in burrows (probably made by rats originally), and appears to be equally common in cultivation and in uncultivated tracts. It is chiefly nocturnal, but is occasionally seen abroad hunting in the daytime. It feeds on birds, rats, mice, lizards, beetles, and snails, and probably, like the common polecat, on any animals that it can master, and is excessively sanguinary. A caged animal kept by Hutton killed in succession 4 wagtails and 4 rats, two of the latter full-grown and large. The rats were always seized in the same place, just behind the ear, held until they ceased to struggle, and then killed by one or two bites through the back of the skull. As the blood flowed from the wounds, the polecat lapped it up, but never attempted to suck it. Although the animal that slaughtered all these birds and rats had been fasting for some time, it made no attempt to eat its victims during the day, but stored the bodies in a portion of its cage divided off as a sleeping apartment, and only fed after nightfall. The whole account given (*l. c.*) is too long to copy, but is worth reading.

The young are produced in holes about the end of March or beginning of April and are usually three or four in number.

This species has the same disagreeable fœtid odour that is characteristic of the common polecat.

81. **Putorius erminea.** *The Ermine or Stoat.*

Mustela erminea, *L. Syst. Nat.* i, p. 68 (1766); *Hodgson, J. A. S. B.* vi, p. 564, x, p. 909, xi, p. 280; *Horsf. Cat.* p. 104; *Blyth, Cat.* p. 68; *Blanf. Yark. Miss., Mam.* p. 32.

Body very slender. Tail about a third the length of the head and body. Soles of feet covered with hair except the small toe-pads. Fur soft, with woolly underfur.

Skull elongate, muzzle very short. The bony palate continues back for more than half the distance between the last molars and the end of the pterygoids, which are simple at the end, not curved outwards, nor is there any process opposite to them projecting from the bulla. Upper molar concave before and behind, so as to be slightly dumbbell-shaped, and slightly emarginate posteriorly on the outer edge.

Colour. In summer dull chestnut (reddish brown) above, white or yellowish white below, the terminal portion of the tail black. The underfur on the back paler. In winter the whole of the fur is white except the tail towards its extremity, which remains black. In some countries, as in England, the white winter garb is seldom assumed.

Dimensions. Head and body 9 to 11 inches, tail with hair $4\frac{1}{2}$ to 6, without hair about 3 to 4. Males are larger than females. A skull measures 1·7 in basal length, and 1 inch in breadth across the zygomatic arches.

Distribution. Throughout the Palæarctic region as far south as the Alps and the Himalayas. A specimen was obtained in Afghanistan by Griffith, and the species was recorded from Nepal by Hodgson; but the only specimen made over by him to the British Museum is a furrier's skin, said to have been brought from Tibet. Adams says the species is found in the lower and middle regions of the Western Himalayas, but Jerdon very pertinently remarks that no Himalayan examples exist in any of our museums. Indeed the only thoroughly authentic occurrence within our area appears to be that mentioned by Dr. G. Henderson in 'Lahore to Yarkand,' p. 42. He shot a specimen near Dras, north of the Zoji-la, Kashmir. The skin is, I believe, that now preserved in the Indian Museum, Calcutta. Dr. Henderson remarked that the animal was probably rare in the locality, for the people had no name for it.

Habits. The ermine lives in holes in the ground made by rodents, amongst rocks or heaps of stones, or in hollow trees, sometimes hunting in the daytime, but more frequently at night, and killing any mammals, birds, or reptiles that it can master. It kills rats and mice of all kinds, and is well known to be very destructive to rabbits and to feathered game generally. It climbs well, and plunders birds' nests of eggs and young. It is bold and sanguinary. In Europe it pairs in February or March, and has young, usually 5 to 8 in number, in April or May; the latter are blind for 9 days, remain with the mother till the autumn, and are full-grown in the following spring.

The white winter skins from the North, where the fur is thick and close, form the valuable ermine of commerce.

82. **Putorius subhemachalanus.** *The Himalayan Weasel.*

Mustela (Putorius) subhemachalana, *Hodgson, J. A. S. B.* vi, p. 563 (1837); *Horsf. Cat.* p. 103; *Jerdon, Mam.* p. 83.
Mustela humeralis, *Blyth, J. A. S. B.* xi, p. 99.
Mustela horsfieldii, *Gray, A. M. N. H.* xi, p. 118 (1843).
Mustela hodgsoni, *Horsf. Cat.* p. 103, *nec Gray.*

? *Kran* or *Gran*, Kashmir *; *Sang-king*, Lepcha; *Temon*, Bhot.

* See under *P. canigula.*

Tail moderately bushy, and, without including the hair at the end, nearly half the length of the head and body. Fur moderately long, soft, with some woolly underfur. Soles hairy; long hair between the toe-pads, and between them and the palmar and plantar pads, sometimes almost concealing them. Anal glands as in other species.

Skull more elongate than that of *P. erminea*, and muzzle narrower; otherwise similar. The dentition presents no difference of importance.

Colour. Brownish red, ranging from bright chestnut to bay, some being considerably brighter and more rufous in tint than others; underfur hair-brown. The tip of the tail and the nose are darker, but not black. Chin white, and in many specimens there are white spots or patches on the breast.

Dimensions. Head and body in a large (? male) specimen $15\frac{1}{2}$ inches, tail without hair 6, with hair $7\frac{1}{2}$, tarsus and hind foot $1\frac{3}{4}$. In a small (? female) example the corresponding measurements are 10, 4, 5, and $1\frac{1}{2}$ inches. Weight of a young male 9 ounces. A skull measures 1·85 inches in basal length, and nearly 1 inch in zygomatic breadth.

Distribution. This weasel is found in Nepal and Sikhim at elevations from 7000 to 13,000 feet (I have a specimen procured on Chola by Mr. Elwes at the last-named elevation, and Hodgson caught two in his house at Darjiling). Blyth (J. A. S. B. xxiii, p. 215) records specimens collected by Dr. Stewart near Landour and Mussoorie, and Jerdon states that the species is common in Kashmir, where Leith Adams also records its occurrence; but all the skins I have seen from the Western Himalayas belong to the next species. The specimen procured by Griffith, and erroneously referred by Horsfield to *M. hodgsoni*, is labelled from Afghanistan. Some of Griffith's collections thus labelled were from the Khási hills, so no dependence can be placed upon the locality.

Varieties. The type of *Mustela horsfieldi*, which was brought from Bhutan, is now in the British Museum. It is smaller and much darker-coloured than Hodgson's type of *M. subhemachalana* in the same collection. But the tint is evidently variable in this species, and as the distribution of colour is precisely similar, I have very little doubt that the difference in size is sexual, and that the two are identical, as was suggested by Jerdon. In Hodgson's MS. drawings three of these darker specimens are represented, and all are noted as young.

Nothing is known of the habits of this weasel.

83. **Putorius canigula.** *The white-nosed Weasel.*

Mustela canigula, *Hodgson, J. A. S. B.* xi, p. 279 (1842).
Mustela hodgsoni, *Gray, A. M. N. H.* xi, p. 118 (1843).

Tail moderately bushy, about half the length of the head and body. Fur of moderate length Soles hairy.

Skull (fig. 40, p. 162) decidedly elongate, the comparatively narrow area behind the postorbital processes very long, but nowhere distinctly contracted, the sides being subparallel.

Colour. Chestnut (brownish red), some specimens darker than others, some being bright chestnut, almost fawn-colour, the tail-tip not darker. Underfur hair-brown. The nose as far back as the eyes, both lips, the chin, and a variable area on the throat and upper breast white.

Dimensions. Head and body 15½ inches, tail without hair 7½, with hair 9½. The above are Hodgson's measurements, but are from a skin, and therefore only approximate. A skull from Kashmir is 2·05 inches in basal length, 1·1 broad across the zygomatic arches.

Distribution. Hodgson's types were from Lhassa in Tibet. There are specimens in the British Museum, collected by Major Kinloch, from Chamba and Pangi in the N.W. Himalayas, at an elevation of 8000 feet in each case. I have a skin obtained by Mr. Theobald at Dharmsala, and the species is probably that "with a white blaze on the face" observed by Mr. Lydekker in the Chenáb valley. I cannot help suspecting that this form may inhabit Kashmir, and that it may have been mistaken for its near ally *P. subhemachalanus*. If this be the case, *P. canigula* is probably the Western cis-Himalayan species, *P. subhemachalanus* the Eastern, the former extending further east, however, in Tibet.

Nothing particular is known of the habits of *P. canigula*.

The type of *Mustela hodgsoni*, Gray, is in the British Museum, and is a rather small and dark-coloured individual of the present species. The name has by Horsfield, Blyth, and Jerdon been applied to other kinds.

84. **Putorius alpinus.** *The pale Weasel.*

Mustela alpina, *Gebler, Mém. Soc. Imp. Nat. Moscou*, vi, p. 213 (1823); *Horsf. Cat.* p. 104.
Mustela temon, *Hodgson, J. A. S. B.* xxvi, p. 207; *Blanford, Yark. Miss., Mam.* p. 32; *Scully, P. Z. S.* 1881, p. 203; *id. A. M. N. H.* (5) viii, p. 97.

Temon, Tibetan.

Tail moderately hairy, about half the length of the head and body. Fur short, soft, very thick, with but little woolly underfur. Soles hairy, naked; pads much concealed by the long hair between them. Claws very slightly curved, blunt.

Colour. Above and on the sides light brown (or, as Hodgson calls it, brunnescent fawn) to hair-brown. Underfur rather darker brown at the base, then whitish when the fur is in good condition, the tips brown. Tail the same colour as the body or rather paler. Lower parts, as a rule, yellow or white, with a distinct line of separation from the brown of the sides; but in other specimens there is no distinct separation of colour, and the lower parts are

pale brown with a yellow or orange tinge. Forehead rather darker than the back; sides of the head paler brown; both lips, with the chin and the fore feet above, white, and frequently the inside surface of all the limbs and a small portion of the hind feet. Indistinct brown spots are sometimes found on the breast and abdomen.

Dimensions. The only measurements are from skins. Head and body 9½ to 11½ inches, tail without hair 5 to 5½, with hair about 6½, hind foot to calcaneum 1½. A skull from Hodgson's collection measures 1·82 in basal length, and 1 in breadth; another 1·7 by 0·97; whilst one from Kumaon is much smaller, only 1·5 by 0·82. The latter may be a female.

Distribution. Within our area this species has been obtained from the country on the northern frontier of Sikhim by Hodgson and Mandelli, from Kumaon by Strachey, and from Gilgit by Scully, and it probably occurs throughout the higher Himalayas and Tibet. The type of *P. alpinus* was from the Altai, and a species, said to be the same, was found in Amurland by Radde.

Habits. The typical *P. alpinus* is said by Gebler to have young in May, the number not exceeding five. The pairing-season is in February.

The typical skins and skulls of *P. temon* agree well with Gebler's description of *P. alpinus*, and with specimens from the Altai in the British Museum, but the individual from Kumaon, although similar in colour, is remarkably small, agreeing, however, in its dimensions with those given by Radde (Reis. Süd. Ost-Sib. i, p. 50) for the species. It is quite possible that the smaller individuals may be females.

85. **Putorius cathia.** *The yellow-bellied Weasel.*

Mustela (Putorius) kathiah, *Hodgson, J. A. S. B.* iv, p. 702; *Horsfield, Cat.* p. 102; *Jerdon, Mam.* p. 84.
Mustela auriventer *v.* cathia, *Hodgs. J. A. S. B.* x, p. 909, xi, p. 280.

Kathia nyal, Nepal.

Fig. 42.—*Putorius cathia.* (From Hodgson's drawings.)

Tail about half the length of the head and body, not bushy.

Fur short and even. Soles partly naked, especially those of the fore feet.

Skull resembling that of *P. erminea* in form, but narrower. The inner lobe of the upper true molar larger than the outer, and having the tubercle in the middle small but prominent, rising from the centre of a slight depression on the surface of the tooth.

Colour. Back, face, and upper surface of head, including the ears, limbs, and tail, bay (dark brownish red); underfur scarcely paler. Lower parts deep yellow, this colour extending to the inside of the limbs, but more in some specimens than in others; chin and upper lip generally whitish. In two specimens from Mussooree, collected by Captain Hutton and now in the British Museum, the inside of the fore legs is yellow to the feet, and in one the upper surface of the feet is partly whitish.

Dimensions. Head and body 9 to $10\frac{1}{2}$ inches, tail without hair 5 to 6, with hair 6 to 7, tarsus and hind foot about $1\frac{1}{2}$; weight about 6 ounces. A skull measures 1·8 inch in basal length, and 1 in zygomatic breadth. Males are rather larger than females.

Distribution. The Himalayas as far west as Mussooree, at moderate elevations (about 3000 to 8000 feet), and some of the hills south of Assam. There is a specimen from the Khási Hills in the Indian Museum, Calcutta.

Habits. Nothing is known about this animal in the wild state; its food, mode of hunting, breeding, &c., probably resemble those of other weasels and stoats. Hodgson states that it is easily tamed, and is employed by the Nepalese to rid houses of rats, for which purpose it is most efficient. It is also trained to attack larger animals—fowls, geese, and even goats and sheep—which it kills by dividing the artery of the neck.

86. **Putorius strigidorsus.** *The striped Weasel.*

Mustela strigidorsa, *Hodgs.*, *Gray* (*errore* strigodorsa), *P. Z. S.* 1853, p. 191; *Horsfield, A. M. N. H.* 2nd ser. xvi, p. 107; *id. P. Z. S.* 1856, p. 398, pl. xlix; *Jerdon, Mam.* p. 85.

Tail, without hair, nearly half the length of the head and body. Fur of moderate length; underfur soft and woolly, longer hairs coarse. Soles partly naked. A fœtid secretion exudes from the anal glands, which are similar to those of *P. cathia.* Mammæ 4, subinguinal.

Colour. Deep bay (dark brownish red) throughout, with the exception of the throat and middle of the breast, which are yellow; the chin, a narrow line down the middle of the back, and another along the belly, which are whitish or white. Underfur on the back a little paler than the terminal portions of the hairs.

Dimensions. Head and body 12 inches long, tail with hair $6\frac{1}{2}$, without $5\frac{1}{2}$, tarsus and hind foot 2; weight $7\frac{1}{2}$ oz. The sex of the specimen measured by Hodgson, to whom we are indebted for the

measurements, is not recorded. There is clearly a considerable difference in size between the sexes.

Distribution. This species has hitherto only been recorded from Sikhim, where two specimens were obtained by Hodgson, probably from a moderate elevation. Two more were procured by Mr. Mandelli, and are in my possession.

Nothing is known of the habits, which are doubtless similar to those of other allied forms. The animal is considerably larger than *P. cathia*, the teeth especially being of much greater size.

Two other species of *Putorius* may hereafter have to be included in the Indian fauna, though at the opposite extremities of the area. The first of these is a weasel described by myself from Eastern Turkestan under the name of *Mustela stoliczkana* (J. A. S. B. xlvi, pt. 2, p. 260, and Sc. Results 2nd Yarkand Mission, Mam. p. 30, pls. i *a*, ii *b*). This is allied to the common weasel of Europe, but is considerably larger and rather different in colour. The following is a brief description, which may suffice for identification.

P. stoliczkana.—Colour pale sandy brown above, on the outside of the limbs, and on the tail, white below. Fur short, dense, and soft. Head and body of a male 9 inches, tail with hair 3, without hair 2·3, tarsus and hind foot without claws 1·4; weight 5·2 oz. Skull 1·75 inches long, 1 broad.

There is a specimen from Afghanistan in the British Museum.

The other species is *P. nudipes*, F. Cuv. (Hist. Nat. Mamm. pl. 149), found in the Malay Peninsula (Cantor, J. A. S. B. xv, p. 194), Sumatra, and Borneo. Like so many other Malay species, this may inhabit Southern Tenasserim. A short description is consequently added:—

P. nudipes.—Tail bushy. Soles partly naked. Fur loose and long, with but little underfur. Colour rusty red, the head above and below white, tail-tip whitish. Head and body about 13 inches, tail without hair $8\frac{1}{2}$, with hair $10\frac{1}{2}$; skull 2·25 inches long, 1·35 broad. It is said by Cantor to inhabit the densest jungle.

P. astutus and *P. moupinensis* have been described by Prof. A. Milne-Edwards * from Moupin, Eastern Tibet, and *P. davidianus* from the Chinese province of Kiangsi. None of these can be satisfactorily identified with Himalayan forms.

P. astutus is dark rufous-brown above, the tail the same colour throughout; breast white, with a yellow tinge. Upper surface of fore feet white. Length of head and body nearly 10 inches, tail $4\frac{1}{5}$, skull 1·8.

P. moupinensis is rufous-brown, a little paler below, the face and the tip of the tail darker; chin white or yellowish white. Head and body $13\frac{1}{2}$ inches long, tail 9, skull 2·2. This approaches *P. subhemachalanus*, but has a longer tail.

P. davidianus is light rufous-brown above and below, the head above darker; no dark tip to the tail; chin, upper lip, and sides of

* 'Recherches,' i, pp. 343–348.

nose white. In a female the head and body measure $11\frac{1}{2}$ inches, tail $6\frac{1}{2}$, skull 2. It is just possible that this may be a variety of *P. canigula*.

In Gray's "Revision of the Genera and Species of *Mustelidæ* contained in the British Museum" (P. Z. S. 1865, p. 117), and in the same author's 'Catalogue of Carnivorous &c. Mammalia' (1869, p. 95), Himalaya is given as one of the localities for *Vison sibirica* (*Mustela sibirica*, Pall.), and the letters B.M. are appended to show that specimens from the Himalaya are in the British Museum. I am, however, unable to find any such specimens in the collection. In Blyth's 'Catalogue of the Mammalia in the Museum of the Asiatic Society,' too, Himalaya and Tibet are given with a mark of doubt amongst the localities for the same species, but this is due to the mistake of supposing *M. hodgsoni* to be a synonym.

Subfamily MELINÆ.

This subfamily comprises the badgers and their allies. All are furnished with claws adapted for digging, and thus present some resemblance to bears, with which they have been classed by some naturalists. None of the true badgers have been recorded from within Indian limits, although at least one species belonging to the genus has been found in Tibet. Three genera, however, belonging to this subfamily are found in India or Burma, and are distinguished from each other by the following characters:—

A. Upper molar broader than long, not larger than upper sectorial.
  a. An external ear; animal paler below than above .. HELICTIS.
  b. No external ear; animal pale above, black below .. MELLIVORA.
B. Upper molar longer than broad, and larger than upper sectorial.
  a. Bony palate prolonged back to glenoid fossa ...... ARCTONYX.

Genus **HELICTIS**, Gray, 1831.

Syn. *Melogale*, Geoffroy (1834).

Size small. Body and head elongate, the nose prolonged and terminating in a naked, obliquely truncated snout, separated from the upper lip by a narrow hairy space. The nose is naked above for about one third the distance to the eyes. Limbs short. Claws much compressed, fore claws about double the length of the hind. Soles naked; on the hind foot the naked portion terminates some distance in front of the heel. Ears short, but distinct. Mammæ 4.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{1-1}{2-2}$. The upper sectorial, which in both Indian and Burmese forms is much larger than the true molar behind it, has a very large inner lobe divided into two distinct pointed cusps. There is a very small pointed cusp at the anterior extremity of the tooth. The molar is broader than long,

the outer margin slightly indented, the crown with several small cusps. The lower sectorial has a heel about one third the length of the tooth.

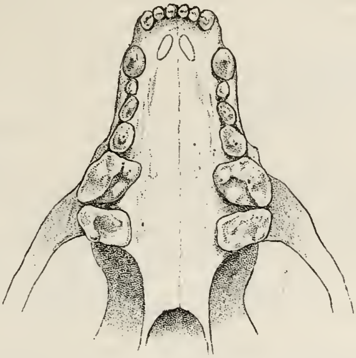

Fig. 43.—Palate of *Helictis personata.*

Skull with the nasal portion narrower than in other genera of the subfamily, and with the palate extending backwards to about halfway between the hindmost molars and the glenoid fossa. Infraorbital foramen large. Vertebræ: C. 7, D. 14, L. 6, S. 4, C ?

The species of *Helictis* have longer bodies and shorter limbs than badgers, but are allied to the latter and not to *Gulo* or any other genus of the *Mustelinæ*, so that it is incorrect to call them wolverines, as Jerdon and others have done. Blyth's term Brock-weasel is better, but the animal is not a weasel. All the species are very similar externally, but there are differences in the dentition.

An account of the anatomy of a Chinese species has been given by Garrod (P. Z. S. 1879, p. 305).

Synopsis of Indian and Burmese Species.

A. Colour brown or yellowish brown, not grey.... *H. orientalis*, p. 173.
B. Colour brownish grey .... *H. personata*, p. 174.

87. **Helictis orientalis.** *The brown Ferret-badger.*

Gulo orientalis, *Horsfield, Java*, pl.
Gulo nipalensis, *Hodgs. J. A. S. B.* v, p. 237, vi, p. 560.
Helictis nipalensis, *Gray, P. Z. S.* 1853, p. 191; *Jerdon, Mam.* p. 80.

Oker, Nepalese; *Nyentek*, Malay.

Tail, without the hair, exceeding half the length of the head and body. Fur consisting of soft woolly underfur and longer coarse piles. Teeth of moderate size; outer lobe of the upper sectorial projecting beyond the extremity of the inner lobe in front and behind; anterior cusp of the inner lobe much larger than the posterior.

Colour. Above dark brown, almost chocolate-brown in general, but some individuals appear rather paler. The underfur is pale brown. A narrow median stripe from the crown of the head to the middle of the back or even to above the hips pure white; also the cheeks and an interrupted band across the forehead, sometimes reduced to a frontal spot. The margin of the ears and terminal third to half of the tail whitish. Lower parts brownish white, sometimes yellowish, the breast and throat paler. Sometimes the pale colour is confined to the middle of the abdomen, the sides being brown.

Dimensions. In a female the head and body measure 16 inches, the tail without hair $7\frac{1}{2}$, with hair 9, hind foot from heel $2\frac{1}{4}$. A skull measures 2·75 inches in basal length, and 1·75 across the zygomatic arches.

Distribution. The Himalayas in Nepal and Sikhim at moderate elevations, and Java. Other supposed localities probably refer to the next species.

Habits. Very imperfectly known. The animal is nocturnal and lives generally in forests, but wanders into houses, and Anderson says he killed one at night in the house of a Sikhim Bhotia, to the disgust of the proprietor, who declared the creature to be useful in destroying cockroaches and other insects.

I am unable to find any distinction between the Himalayan and Javanese forms distinguished by many authors as *H. nipalensis* and *H. orientalis.* The cranial differences noticed by Gray, Anderson, and others appear to be due to individual variation only.

88. **Helictis personata.** *The Burmese Ferret-badger.*

Melogale personata, *Geoff. Bélanger, Voy., Zool.* p. 137, pl. v (1834).
Helictis orientalis, *Blyth, J. A. S. B.* xxxi, p. 332, *nec Horsfield.*
Helictis nipalensis, *Blyth, Cat.* p. 70, *Mam. Birds Burma,* p. 29, *nec Hodgson.*
Helictis personata, *Thomas, P. Z. S.* 1886, p. 59.

Kyoung-u-gyi, Burmese (Tickell); *Kyoung-pyan,* Arakanese.

General proportions precisely similar to those of *H. orientalis.* Teeth much larger, and the upper sectorial nearly trapezoidal, the inner lobe being remarkably developed and the two cusps much less unequal than in *H. orientalis.*

Colour. Above brownish grey. In all other respects this form resembles *H. orientalis*; the dorsal underfur is sullied white, dorsal and frontal bands and cheeks white or yellow, lower parts brownish white or yellow. The longer hairs on the sides have whitish tips. Dark portions of the face much darker than the back generally.

Dimensions. Tickell, in his MS. notes, gives for a female:—head and body 15 inches, tail $8\frac{1}{2}$, hind foot $2\frac{1}{4}$. This I suspect to be small, skulls of this species and stuffed specimens being rather larger than those of *H. orientalis.* The skull of a male measures in basal length 2·85 inches, in breadth 1·87.

Distribution. Recorded from Pegu and Manipur. There is also

a skin, apparently of this species, from Cachar, in the British Museum, and in all probability the specimens obtained by Blyth from Tipperah and Arakan are the same.

Fig. 44.—*Helictis personata.* (From a drawing by Col. Tickell.)

Habits. This animal is nocturnal like other members of the genus, and appears to be omnivorous. One kept alive by Tickell fed upon fruit, insects, lizards, meat, and eggs, and drank by lapping. It was savage and restless, and appeared well able to defend itself against prowling dogs, as it was kept chained to a tree.

Anderson obtained the Chinese type of the genus, *H. moschata*, distinguished by its very small teeth, in Yunnan, and this species may be found in Upper Burma.

Genus **MELLIVORA**, Storr, 1780.

Syn. *Ursitaxus,* Hodgson (1836).

Body stout. Limbs short, strong; fore claws very large. Tail short. No external ear. Coloration peculiar: the upper parts whitish; lower parts and limbs, with the muzzle, uniformly black. Mammæ 4. Anal glands well developed, one opening on each side of the anus. Feet naked below, on the hind feet the naked sole extends to the heel.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{3-3}$, m. $\frac{1-1}{1-1}$. No lower tubercular molar. The upper tubercular (or true) molar much broader than long, thus being transverse and more or less dumbbell-shaped, as in *Mustelinæ.* Upper sectorial large, with the inner tubercle quite at the anterior end. The heel of the lower sectorial very small. Vertebræ: C. 7, D. 14, L. 4, S. 4, C. 15.

The ratels, as they are commonly called in England, have somewhat the form of badgers, but are rather more like bears in gait and appearance. They burrow in the ground, but occasionally

climb trees. One species is found throughout Africa, and one in India, but the distinction of the two is somewhat doubtful.

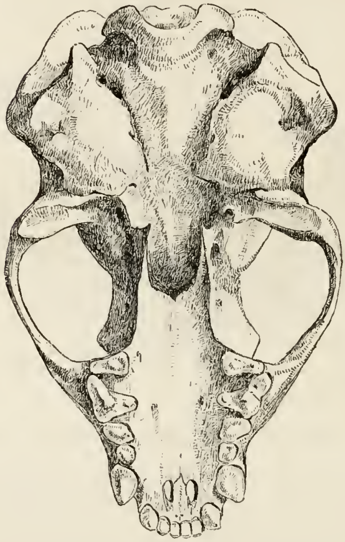

Fig. 45.—Skull of *Mellivora indica.*

Two forms of this genus, *Mellivora sivalensis* and *M. punjabensis*, are found in the Siwalik beds of Northern India, together with a representative of an allied but extinct genus, *Mellivorodon palæindicus.*

89. **Mellivora indica.** *The Indian Ratel.*

Ursus indicus, *Kerr, An. King.* p. 188 (1792).
Mellivora ratel, *Gray, Cat. Mam. Birds Nepal &c. B. M.* p. 13; *Horsf. Cat.* p. 120; *Blyth, Cat.* p. 69.
Mellivora indica, *Jerdon, Mam.* p. 78.
Ursitaxus inauritus, *Hodgson, As. Res.* xix, pt. 1, p. 61; *id. J. A. S. B.* v, p. 671.

Biju, H.; *Gorpat*, Sindhi; *Bájru Bhál*, at Bhagalpur; *Bharsia*, Nipal; *Biyu khawar*, Tel.; *Tava karadi*, Tam.; *Usa banna*, Kol.

Tail without the hair about $\frac{1}{5}$ to $\frac{1}{6}$ the length of the head and body. Fore claws very large, nearly treble the size of the hind claws. No underfur; abdomen very thinly clad.

Colour. Above light grey or whitish grey, lower parts with the limbs black. The dorsal fur consists of longer coarse white hairs mixed with rather shorter and finer hairs which are blackish brown. The whitish upper parts are sharply divided from the black under-surface, and include the crown of the head, though the black area

covers the ears, eyes, and muzzle; the upper portion of the tail also is whitish except at the extremity. Fore claws white.

Fig. 46.—*Mellivora indica.*

Dimensions. According to Hodgson head and body 32 inches, tail 5, with the hair $6\frac{1}{2}$, hind foot to heel $4\frac{1}{2}$. Jerdon gives head and body 26 inches, tail 6. A skull is 4·9 inches in basal length by 3·2 in zygomatic breadth.

Distribution. India generally, from the base of the Himalayas to the extreme south, with the exception of the Malabar coast and Lower Bengal. Not found in Ceylon nor to the east of the Bay of Bengal, but the range extends to the westward certainly as far as Sind.

Habits. Like most of its subfamily the Indian ratel is exclusively nocturnal. During the day it remains in holes, probably dug by itself. According to Jerdon it is most common in hilly districts or in those parts of the alluvial plains of Northern India where the rivers have high banks, affording suitable localities for its dens. It is said to live in pairs, to feed on rats, birds, frogs, and insects, and to be very destructive to poultry. Like the African ratel, it doubtless eats honey and bees when it can get them. Throughout India this animal has the reputation of digging into graves of men in order to feed upon dead bodies, and several of the native names mean "gravedigger," a term often applied to the species by Europeans. In Persia the same belief exists with regard to the badger, and is in all probability equally without the least foundation. Indeed, although the dentition of *Mellivora* is more carnivorous than that of the true badgers, the fact that the ratel in confinement lives well on vegetable food renders it probable that this animal feeds partly on vegetables, probably fruit and roots, in the wild state also. At the same time Jerdon states that he has heard of

several individuals being trapped whilst committing depredations in fowl-houses, and this is confirmed by McMaster.

Nothing appears to be known of the ratel's breeding-habits. In confinement it is very tame, quiet, and playful, and frequently acquires a habit of tumbling head over heels, for this practice has been noticed in different individuals by Hardwicke, Sterndale, and others.

Genus **ARCTONYX**, F. Cuvier (1825).

Body and limbs stout, tail short. Snout long, mobile, naked towards the end, and truncated, the terminal disk containing the nostrils being much like that of a pig. Ears very short and rounded. Eyes small. Feet naked below, the naked sole not extending to the heel in the hind foot. Claws of all feet much lengthened, those of the fore feet longest, all slightly curved and blunt. Hair coarse and long, with woolly underfur. Mammæ 6.

Infraorbital foramen in the skull very large. Bullæ very small. The bony palate extends back to the glenoid fossæ, and is deeply indented behind in the middle. The posterior portion of the palate is formed by processes from the pterygoid bones. This form of palate is peculiar to *Arctonyx* amongst fissipede Carnivora.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{1-1}{2-2}$. The anterior premolars in both jaws often rudimentary or absent. The upper incisors are arranged in a semicircle. The canines are greatly compressed. Upper sectorial furnished with a large median inner lobe, divided by a transverse groove, but without cusps. Upper tubercular molar much larger than upper sectorial, longer than broad, subtrapezoidal, almost lozenge-shaped, with the heel rounded; this heel becomes worn away in old skulls. Lower sectorial with a large low tuberculated heel. Vertebræ: C. 7, D. 16, L. 4, S. 4, C. 20.

The hog-badgers, as Jerdon very appropriately names them, have a singular resemblance to a pig, owing to the form of the snout. But little is known of their habits. Two forms, one of which is very imperfectly known, are recorded from North-eastern India and Burma.

Synopsis of Indian and Burmese Species.

Large; skull from occiput over 6 inches long...... *A. collaris*, p. 178.
Small; skull from occiput less than 5 inches long.. *A. taxoides*, p. 180.

Some details of the anatomy are described by Dr. G. Evans, J. A. S. B. viii, p. 408.

90. **Arctonyx collaris.** *The Hog-badger.*

Arctonyx collaris, *F. Cuv. Hist. Nat. Mam.* pl. 220 (1825); *Evans, J. A. S. B.* vii, p. 732, pl. xliii; viii, p. 408; *Blyth, Cat.* p. 71; *id. Mam. Birds Burma*, p. 29; *Jerdon, Mam.* p. 77.

Mydaus collaris, *Gray and Hardwicke, Ill. Ind. Zool.* i, pl. vi.
Arctonyx isonyx, *Hodgson, P. Z. S.* 1856, p. 398, pl. l.
Meles (Arctonyx) collaris, *Anderson, An. Zool. Res.* p. 196.

Bhála-súr (bear-pig, or according to some *Bála-súr*, sand-pig), H.; *Chomhúvho, Thembakso*, Naga; *Nuloang*, Kuki; *No-ok*, Manipuri; *Quado-Waildu*, Mug; *Khwe-ktu-wet-hti*, Arakan; *Khwe-ta-wek-wek-ta-wek*, Burmese.

Tail about a third to a fourth the length of the head and body.

Colour. Dirty grey above and below, slightly washed with blackish above, the hairs being sullied white throughout, except the ends of the longer hairs on the back and sides, which are black. Head white, with the exception of a dark brown or black band from the upper lip over the eye and ear, and of another from the chin, which

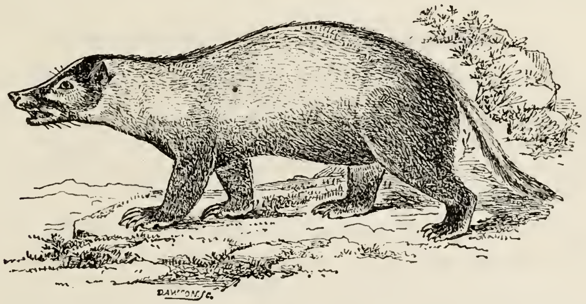

Fig. 47.—*Arctonyx collaris.* (From a drawing by Col. Tickell.)

is dusky, backwards across the cheek, joined by a broader and lighter brown band to the eye and ear-stripe. These head-markings appear variable, sometimes the sides of the head are dark except a white space round the eye. Throat, sides of neck, and tail whitish, lower parts and limbs dusky, the latter sometimes black.

Dimensions. Head and body of a male 30 inches, tail 9, with hair 11, hind foot $4\frac{3}{8}$ (a Moulmain animal measured by Tickell). An old skull is 5·5 inches in basal length and 3·5 broad.

Distribution. The base of the Eastern Himalayas in Nepal and Sikhim, Assam, Sylhet, Cachar, Arakan, Pegu, and Tenasserim. Anderson obtained this animal in Western Yunnan, but it is not mentioned in Swinhoe's lists of Chinese mammals, nor has it been observed south of Tenasserim. Sterndale says that he heard of it in the forests of Seoni in the Central Provinces; but as he never saw a specimen, it is doubtful if this was the animal of which he obtained information.

Habits. According to Tickell, in his MS. notes, the hog-badger frequents undulating stony ground or small hills amongst jungle, and lives in fissures of the rocks or in holes dug by itself. It is thoroughly nocturnal. In captivity it is dull and uninteresting, feeding voraciously on meats, fish, reptiles, or fruit, and it is particularly fond of earthworms. One individual used to pass the

day sleeping in a hole that it had dug and was very savage if disturbed. When angry it made a loud grunting noise and bit fiercely. It was dull of sight, and its only acute sense appeared to be that of smell. It was in the habit of raising its snout in the air in order to scent anyone who approached, much as a pig does. This animal had no disagreeable smell.

Anderson observed an individual, that was kept in the Zoological Gardens of Calcutta, pound plantains to a pulp with its snout before sucking them into its mouth.

McMaster met with this species near Shwe-Gyeng in Pegu, and observed its bear-like gait, which was also noticed by Duvaucel. It is said to support itself easily in an erect position on its hind feet much as bears do.

91. **Arctonyx taxoides.** *The small Hog-badger.*

Arctonyx taxoides, *Blyth, J. A. S. B.* xxii, p. 591 (1853); *id. Cat.* p. 71; *Anderson, An. Zool. Res.* p. 196.
? Meles albogularis, *Blyth, J. A. S. B.* xxii, p. 590.
? Meles leucolæmus, *M.-Edw. An. Sci. Nat.* (5) viii, 1867, p. 374; *id. Recherches Mam.* p. 195, pls. xxiv, xxvi, xxvii, xxviii.
? Arctonyx obscurus, *M.-Edw. Rech. Mam.* p. 338, pls. lviii, lxii.

"Adult about half the size of the adult of *A. collaris*, having a much finer and longer coat, ... the muzzle less broad and hog-like; . . . . the ears also are proportionally smaller; the tail is shorter, and the colour and markings, though similar, are much brighter. Dentition of the upper jaw similar in the two species; in the lower jaw the interspace between the second and third pre-molars is proportionally much greater in *A. collaris* than in *A. taxoides*." (*Blyth, l. c.*)

Dimensions. The skull of a fully adult female measures:—Extreme length (that is, doubtless, from occiput to anterior border of premaxillaries) $4\frac{3}{4}$ inches, breadth across zygomata $2\frac{3}{8}$, length of bony palate $2\frac{3}{4}$, width at posterior great molar (? between hinder molars) $\frac{13}{16}$. The corresponding measurements in an old female of *A. collaris* are $6\frac{1}{8}$, $3\frac{5}{8}$, $3\frac{7}{8}$, and $1\frac{1}{16}$. (*Blyth, l. c.*)

Distribution. Assam and Arakan, perhaps also China. The above details are from Blyth's original description, and are confirmed by Anderson. I have been unable to examine specimens of late. Mr. W. L. Sclater has recently sent to me some additional notes on the dentition of the types of *A. taxoides*. He finds that the last upper premolar is trapezoidal in section, and has no tubercles on the inner side; the corresponding tooth of *A. collaris* is subtriangular in section, and bears one or two inner tubercles.

No true badger of the genus *Meles*, with a bony palate much less produced backwards than in *Arctonyx*, has hitherto been observed within the limits of India or its dependencies; but a species has been recorded from Tibet, north of Nepal and Sikhim, and may occur in Western Tibet also or in parts of the Himalayas. This animal was described by Hodgson as *Taxidea leucura* (J. A. S. B.

xvi, p. 763, pl. xxix). The species is, however, a typical *Meles*, not a *Taxidea*, and very closely allied to the European *M. taxus*, of which it may prove only a variety. It is grey above, the hair long and grizzled, being white at the base, black near the end, and white again at the tips. Lower parts and limbs dusky or black, and a blackish line from the upper lip over the eye. Head and body 27 inches, tail 7, and with hair 10. Skull of a female 4·2 inches long from foramen, 2·65 broad across zygomata.

The other recorded species from Tibet, *M. albogularis*, Blyth, is probably an *Arctonyx*. *Meles taxus* or an allied form may perhaps occur in Southern Afghanistan and Baluchistan.

Subfamily LUTRINÆ.

The otters form the last subdivision of the *Mustelidæ*, and are a well-marked group in which the general musteline type is profoundly modified and the animal adapted for swimming. The feet are strong, short, and rounded, and the toes webbed. The body is very long. The tail is of considerable length, thick at the base, and in general flattened. The head is broad and depressed. The upper posterior molars are large and subquadrate.

Three fossil species of otter have been detected in the Siwalik beds of the Punjab: two of these, *L. palæindica* and *L. bathygnathus*, were not larger than living species; whilst the third, *L. s valensis*, was the size of a leopard, and had a very different upper sectorial tooth. It was distinguished by Falconer as *Enhydriodon*.

Genus **LUTRA**, Erxleben (1777).

Syn. *Aonyx*, Lesson; *Barangia* &c., Gray.

The feet are in general completely webbed. Soles of the feet naked, the naked sole of the hind foot not extending to the heel. Head long and flat. Ears small. Fur close and short, with woolly underfur.

Skull broad and depressed, with the brain-case large, the facial portion in front of the orbits very short, the frontal region between the orbits and the brain-case long.

Vertebræ: C. 7, D. 14–15, L. 6–5, S. 3, C. 20–26.

Dentition: i. $\frac{3-3}{3-3}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{3-3}$, m. $\frac{1-1}{2-2}$. Anterior upper premolar very small, situated quite inside the canine. Upper sectorial with a trenchant tricuspid blade and a very large inner lobe, having a raised sharp edge and a deep hollow between the edge and the main blade of the tooth. True molar large, subrectangular broader than long.

All otters are very much alike externally, and the determination of the species is consequently in some cases difficult; but the various

forms are readily discriminated by their skulls. Dr. Anderson has, I think, succeeded in clearing up much of the confusion in which the Indian species had been left by Gray and others.

Synopsis of Indian, Ceylonese, and Burmese Species.

A. Claws distinct and well developed on all toes.
  a. Head and body more than 2 feet long in adults.
    a. Upper margin of naked nose angulate in middle; dorsal fur generally grizzled .. *L. vulgaris*, p. 182.
    b. Upper margin of naked nose straight; dorsal fur not grizzled .... *L. ellioti*, p. 185.
  b. Head and body 20–22 inches .... *L. aureobrunnea*, p. 186.
B. Claws small and rudimentary; size small.... *L. leptonyx*, p. 187.

92. **Lutra vulgaris.** *The common Otter.*

Lutra vulgaris, *Erxleben, Syst. Reg. An.* p. 448 (1777); *Blyth, Cat.* p. 73; *Jerdon, Mam.* p. 88, *partim*; *Scully, P. Z. S.* 1881, p. 203.
Lutra nair, *F. Cuv. Dict. Sc. Nat.* xxvii, p. 247 (1823); *Elliot, Madr. Journ. L. S.* x, p. 100; *Blyth, Cat.* p. 72, *partim*; *Jerdon, Mam.* p. 86, *partim*; *Anderson, An. Zool. Res.* pp. 206 &c., pl. xi (skull); *Kelaart, Prod.* p. 35.
Lutra indica, *Gray, Charlesworth's Mag. N. H.* i, p. 580 (1837).
? Lutra taraiyensis, *Hodgson, J. A. S. B.* viii, p. 319 (1839).

Ud, Ud biláo, Páni kutta, H.; *Sag-i-áb*, P.; *Lad, Pán-manjar, Jal-manjar, Jal-mánus*, Mahr.; *Nirunai*, Tam.; *Niru-Kuka*, Tel.; *Nirnai*, Can., Mal.; *Dalwai bek*, Wadári.

The upper edge of the naked muzzle where the hairy part of the nose begins is not straight, but projects in the middle and is concave on each side, running up considerably to the hinder edge of the nostril on each side.

Skull (fig. 48) much depressed and elongate, the length being nearly double the breadth of the brain-case. The frontal region of the skull behind the postoccipital processes narrows gradually for some distance, then expands to form the brain-case. Teeth of moderate size, the rounded inner lobe of the upper sectorial about two thirds the length of the tooth; length of upper sectorial along its outer margin not exceeding the breadth of the six upper incisors taken together.

Colour. Above hair-brown, with a more or less rufous tinge; woolly underfur at the base white, then brown, the tips of the longer hairs usually paler, producing in most Indian specimens a grizzled appearance, which is very characteristic. Lower parts (including the base of the tail below, abdomen, breast, and inside of limbs, throat, chin, and sides of head and neck below the ears) whitish; fur of the chin and throat white throughout, of the other parts white at the base, then light brown, and the tips white. These white tips are much more distinct in old specimens, in which

the colours of the upper and under surfaces are well defined. The young is dusky brown above, paler below, with the two colours less distinct.

Dimensions. Head and body 25 to 29 inches, tail 15 to 16; weight about 16 to 20 lbs., sometimes more. (The measurements given of this animal in India are inextricably mixed up with those of the next species.) A Calcutta skull of an old male measures in basal length 4·25 inches, zygomatic breadth 2·7, height from between bullæ 1·35 (in another 1·5). The corresponding measurements of a female skull are 4, 2·55, and 1·3 inches.

Distribution. The common otter is found throughout the Palæarctic region, extending into the North-west Himalayas; and the Indian form, usually known as *L. nair*, appears to inhabit nearly the whole of India and Ceylon, and to occur east of the Bay of Bengal. Owing to the circumstance that the next species, *L. ellioti*, has only lately been clearly distinguished, the relative distribution of the two cannot be precisely ascertained.

Varieties and Synonymy. Although I can find no constant characters by which to distinguish the Indian otter, *L. nair*, from the European otter, *L. vulgaris*, I cannot help suspecting that they may be distinct. As a rule, *L. vulgaris* appears to be larger, the fur is more rufous and but rarely grizzled. The skull is larger, the brain-case broader, and the upper sectorial and molar proportionally smaller and shorter. Generally the anterior point of the upper sectorial is nearer to the hinder edge of the molar than to the anterior border of the canine. The reverse is the case in *L. nair*. But on examining a considerable series I find not one of these characters constant, and the skulls, as well as the skins, appear to me in some cases undistinguishable.

The type of *L. nair* came from Pondicherry; that of *L. indica* was also from Southern India, and was collected by Sir W. Elliot.

Anderson (*l. c.* p. 207) has pointed out how difficult it is to identify Hodgson's species, as the types were forwarded to the British Museum without the names being attached, and the skulls were received separately without any indication of the skins to which they respectively belonged. The skins now marked *L. tarayensis* in the Collection belong to the next species, but Hodgson's description must, I think, apply to the present.

Habits. Otters inhabit rivers chiefly, but are occasionally found in India in large tanks, and they are common in the great backwaters of the Western Coast, and in the Chilka Lake of Orissa. They also occur in salt-water inlets and tidal streams, and occasionally enter the sea. They are usually seen in India in parties of five, six, or more, consisting probably of a pair of old animals and their full-grown or nearly full-grown offspring. These live together in a den, usually amongst rocks, or, in alluvial countries, in an extensive burrow with several entrances on an elevated spot close to the water. One entrance to the den is generally under the water. The presence of otters, wherever they inhabit, is

easily recognized by their peculiar web-footed tracks on the sand or mud.

To a considerable extent otters are nocturnal, but in wild countries they are by no means exclusively so. I have repeatedly seen them hunting in rivers up to 9 or 10 o'clock in the morning and again in the afternoon long before sunset. They live chiefly upon fish, crustacea, and frogs, and, as is well known, when they find food plentiful, kill far more than they require to eat. They are said occasionally to attack waterfowl, and to eat the eggs of birds, and in all probability they are, if hungry, not particular; I once came upon a party that were pulling about a small crocodile, but I cannot say whether they had killed it. Their movements in the water are exceedingly rapid and graceful, and they can run with considerable speed on land. In fishing, otters act in concert and surround or drive a shoal of fish. Colonel McMaster, in his 'Notes on Jerdon,' describes an instance in which he saw this done in the Chilka Lake. The otters, at least six in number, swam out in a semicircle, with an interval of about fifty yards between each two. "Every now and then an otter would disappear, and generally when it was seen again it was well within the semicircle with a fish in its jaws, caught more for pleasure than for profit," as the fish were always left untouched after a single bite.

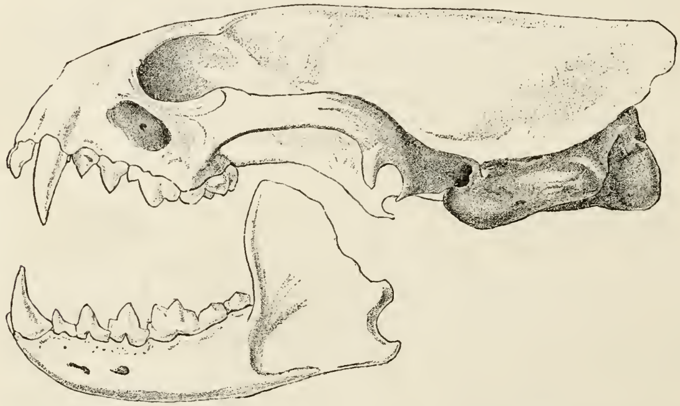

Fig. 48.—Skull of *Lutra vulgaris*. (*L. nair*, Anderson, An. Zool. Res.)

The hearing and sense of smell in otters are well developed; but I am inclined to think them not very sharp of sight. They are very intelligent and cunning. Their usual cry is a sharp yelp, which they utter when excited or surprised. They are also said to make a whistling sound as a note of alarm.

I cannot find anything recorded about the breeding of otters in India. In Europe they have frequently bred in confinement (P. Z. S. 1881, p. 249). They sometimes, at all events, pair in the

water. There appears to be no particular season for breeding, but the young are generally born in the winter, and the same is probably the case in India. The period of gestation is about sixty-one to sixty-three days, the number of young usually from two to five; these are blind for some time after birth.

Otters are easily tamed when captured young, and become very much attached to their masters, whom they will follow like a dog. They are kept tame by fishermen in several parts of India, especially in Jessore, the Bengal Sunderbans, and on the Indus, and are employed to drive the fish into nets, not, as in China, to actually capture fish for their masters.

93. **Lutra ellioti.** *The smooth Indian Otter.*

Lutra monticola, *Hodgson, J. A. S. B.* viii, p. 320 (1839); *Anderson, An. Zool. Res.* p. 207, pl. xii, figs. 1–3 (skull).
Lutra taraiyensis, *Blyth, J. A. S. B.* xi, p. 99, *nec Hodgson.*
? Lutra simung, *Horsfield, Cat.* p. 116.
Lutra nair, *Cantor, J. A. S. B.* xv, p. 195; *Blyth, Cat.* p. 72, *partim*; *id. Mam. Birds Burma,* p. 28, *nec Cuv.*
Lutra ellioti, *Anderson, An. Zool. Res.* p. 212.

Ludra, Sindhi; *Hpyan,* Burm.; *Phey,* Talain; *Bong,* Karen; *Mamrang, Amrang, Anjing-ayer,* Malay.

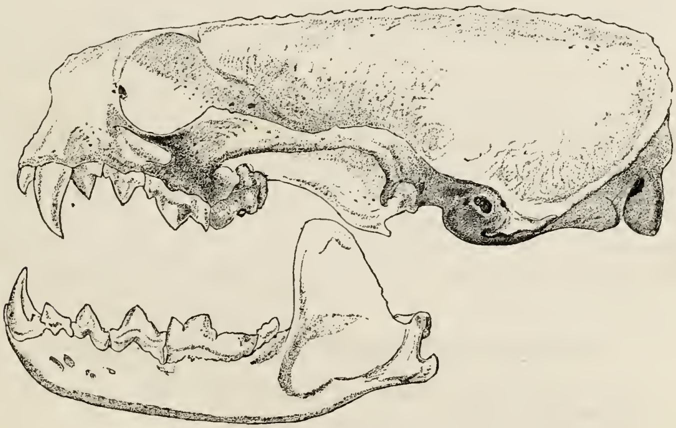

Fig. 49.—Skull of *Lutra ellioti.* (*L. monticola,* Anderson, An. Zool. Res.)

The upper border of the naked muzzle is nearly straight from end to end. Fur smooth and short.

Skull elongate, but much less depressed than that of *L. vulgaris.* Frontal region of skull with the sides parallel for some distance behind the postorbital processes, and then suddenly constricted, so that there is the appearance of a postorbital swelling.

Molar teeth large; the inner lobe of the upper sectorial very large, more than half the breadth of the tooth, and exceeding two thirds the length. The length of the upper sectorial along the outer edge exceeds the breadth of the six upper incisors taken together.

Colour. Very uniform hair-brown above, with a slight greyish tinge, and without any trace of grizzled appearance. Some specimens are more rufous. Underfur pale brown. Lower parts lighter brown; the breast, throat, chin, and sides of head and neck whitish or white. In some specimens, probably old, the tips of the hair on the abdomen are white.

Dimensions. Rather less than those of *L. vulgaris.* A large skull, probably male, measures 4·7 inches in basal length, 3·2 in breadth, and 1·8 in height from between the bullæ. A female skull is 4·36 inches long, 2·9 broad, and 1·7 high, similarly measured. I learn from Mr. Scully that this otter is shorter than *L. vulgaris*, though more robustly built, with a much larger skull. No trustworthy measurements are available.

Distribution. Apparently throughout India, from the Lower Himalayas. Common in the Indus, in Sind, also in Lower Bengal, Burma, and the Malay Peninsula.

Synonymy. This is, I think, probably the *L. monticola* of Hodgson, and there are several specimens in his collections; but as the species is not a hill-otter the name is misleading, and must be abandoned. *L. simung* of Horsfield is founded on a skin without a skull from Sumatra, and, though probably referable to this species, the identification is uncertain. I consequently, at Mr. Scully's suggestion, adopt the name *L. ellioti.*

Habits. Probably very similar to those of *L. vulgaris.* Whether this is the species kept tame by the Mohánas of Sind and employed by them in fishing, and in capturing porpoises as described by Hume ('Stray Feathers,' i, p. 110), I am doubtful; the tame otter appeared to Hume, as it subsequently did to me, a small kind. There can, however, be little doubt that this is one of the species kept tame and used for fishing by the Malays, as mentioned by Cantor.

94. **Lutra aureobrunnea.** *The Himalayan Otter.*

Lutra aurobrunnea, *Hodgson, J. A. S. B.* viii, p. 320; *Anderson, An. Zool. Res.* p. 212.
? Barangia nepalensis, *Gray, P. Z. S.* 1865, p. 124.

"Habit of body still more vermiform (than in *L. indigitata* = *leptonyx*). Tail less than $\frac{2}{3}$ of the body. Toes and nails fully developed. Fur longish and rough. Colour rich chestnut-brown above, golden red below and on the extremities. Length of head and body 20 to 22 inches, tail 12 to 13; weight 9 to 11 lbs."

The above description is quoted from Hodgson. No other naturalist has met with this otter; but there is good evidence in Hodgson's collections at the British Museum that at least one

species, besides *L. vulgaris*, *L. ellioti*, and *L. leptonyx*, is found in Nepal.

There is in the first place the skull to which Dr. Gray gave the name of *Barangia nepalensis*. *Barangia* was a genus founded on the hairy-nosed Malay otter (*Lutra sumatrana*). The Nepal skull is imperfect behind, but would, if perfect, probably be about 4 inches long. The zygomatic breadth is 2·45. The teeth are small. There is much resemblance to the skull of *L. sumatrana*, but the hinder upper molar is differently shaped, the inner lobe having the same antero-posterior length as the outer. In the Malay species the inner lobe is smaller. This skull is perfectly distinct from those of all known Indian otters.

There is also a flat skin of an otter, rich dark brown throughout, slightly paler and with a golden tinge below. The fur is thick and woolly and somewhat harsh. Both texture and colour may be due to some preservative process. The skin is stretched and distorted, having evidently been hung up by the nose to dry, and it is impossible to say whether the nose was hairy or not. This may be the dyed skin of a young *L. vulgaris*, or it may, as Anderson has suggested, belong to the same animal as the skull already mentioned. The circumstance that only one of each exists in the collection is in favour of the latter view.

Hodgson, as quoted above, gives varying measurements and weights, and from this it might be inferred that he examined more than one individual. I can find no information about the animal in his MS. notes.

It is very probable that *L. sumatrana*, the hairy-nosed Malay otter (*L. barang* of Cantor, though not, as Anderson has shown, *l. c.* p. 204, of F. Cuvier), may extend its range into Tenasserim and even further north. This species and its skull are figured by Anderson (*l. c.* pls. x, xii). It is a large otter, the length of the head and body in an old male, according to Cantor, being 32½ inches, tail 20, and the colour is deep rich brown throughout, except on the chin and throat, which are whitish. The nose is entirely hairy in young specimens, but in older individuals the hairs become partially worn off. That a third species, besides *L. ellioti* and *L. leptonyx*, is found in Pegu is suggested in Col. McMaster's notes.

95. **Lutra leptonyx.** *The clawless Otter.*

Lutra leptonyx, *Horsfield, Res. Java* (with figure); *Blyth, Cat.* p. 73; *Jerdon, Mam.* p. 89.
Lutra indigitata, *Hodgson, J. A. S. B.* viii, p. 320.
Aonyx leptonyx, *Cantor, J. A. S. B.* xv, p. 195; *Horsfield, Cat.* p. 117; *Blyth, Mam. Birds Burma*, p. 28.

Chusam, Bhot.; *Suriam*, Lepcha; *Anjing-ayer*, Malay.

Tail about half the length of the head and body. Head short,

rounded. Claws extremely small and rudimentary, and sometimes wanting altogether; the third and fourth toes on all feet considerably longer than the other toes.

Skull much shorter than in other Indian forms, the length being but little more than one and a half times the breadth of the brain-case, which is very broad. The inner lobe of the upper sectorial large. The upper (last) molar much larger in proportion to the breadth than in other species.

Colour. Moderately deep brown, with a more or less rufous tinge above, paler below; sometimes the difference is very slight, except on the cheeks and upper lip, with the sides of the neck, chin, and throat, which are whitish or white; this colour is sharply divided from the brown on the sides of the head and neck, but passes gradually into the paler brown of the breast. The under-fur of the back is lighter in colour near the base.

Dimensions. Head and body 22 to 24 inches, tail $10\frac{1}{2}$ to 13, hind foot $3\frac{1}{2}$; weight 11 to 13 lbs. A skull measures 3 inches in basal length and 2·25 wide across the zygomatic arches; another 3·1 by 2·4.

Distribution. The clawless otter is found throughout the greater part of the Oriental region. It inhabits the Himalaya generally at low elevations, is found in Lower Bengal, being common near Calcutta, in Assam, Burma, Southern China, the Malay Peninsula, and several of the islands, including Java. Beyond Lower Bengal this species has not been recorded from the peninsula of India, except at considerable elevations on the Nilgiri and some other ranges in the Madras Presidency; but a small otter said by Kelaart to inhabit the neighbourhood of Newera Ellia, in Ceylon, is very possibly *L. leptonyx*.

Habits. Similar, so far as is known, to those of other otters. This animal is said by Cantor to be kept tame and employed by fishermen in Malacca, together with other species.

By many writers the small clawless otter, *Lutra leptonyx*, is separated from other Indian otters and classed in a distinct genus, *Aonyx*, the type of which is the Cape otter, *L. inunguis*. This is distinguished by having the merest rudiments of claws and the toes half-webbed. *L. leptonyx* also has very small claws, though not quite so rudimentary as those of *L. inunguis*, but the toes are as fully webbed as those of most otters. Although it does not differ from *Lutra* in the same manner as the type of *Aonyx* does, *L. leptonyx* has several peculiarities of its own not shown by its supposed ally. Its skull is peculiarly short and broad, with a differently shaped upper posterior molar, and its feet differ from those of other species, including *L. inunguis*, in the much greater proportional length of the third and fourth toes.

The most remarkable peculiarity of *L. leptonyx*, the form of the skull, is repeated in a South-American species of otter, *L. felina*.

Family PROCYONIDÆ.

In the classification hitherto followed, that of Professor Flower, the Himalayan genus *Ælurus* is made into a separate family; but the differences from the American *Procyonidæ*, comprising the racoons (*Procyon*), kinkajou (*Cercoleptes*), and their allies, do not appear sufficient to justify the separation. Hodgson pointed out several characters in which *Ælurus* agrees with the *Procyonidæ*, and others have been recorded by Flower. Blyth, in his Catalogue, placed the genus between *Cercoleptes* and *Procyon*, and the only distinctions especially mentioned by Flower are the presence in *Ælurus* of an alisphenoid canal which is wanting in the American types, and the Asiatic habitat of the former genus. The case of *Viverricula* already mentioned shows that the presence of an alisphenoid canal is not necessarily a character of importance, whilst to admit geographical distribution as a reason for distinguishing biological groups appears a mistake, and liable to cause incorrect ideas as to natural affinities and the relations of faunas in different regions. I feel even doubtful whether a separate subfamily is required for the Asiatic representative of the *Procyonidæ*.

The members of this family are distinguished by having two true molars on each side, both in the upper and lower jaw.

Genus **ÆLURUS**, F. Cuvier (1825).

This genus contains but a single species peculiar to the Himalayan region.

The head is round, the face short and broad, the eyes directed forward, the pupil round, the ears well developed; the limbs stout, plantigrade, densely covered with hair below; the claws large, curved, sharp, and semiretractile. Tail long. Mammæ 8. Vertebræ: C. 7, D. 14–15, L. 6–5, S. 3, C. 18.

Skull high and compressed. The zygomatic arches very strong and much curved upwards. The coronoid process of the mandible remarkably high, and the distance from the condyle to the angle also unusually great, with the result that the ascending ramus of the lower jaw is singularly developed.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{4-4}$, m. $\frac{2-2}{2-2}$. The canines are much compressed. The molar teeth are very peculiar (see figure), and differ widely from those of all other Asiatic Carnivora. They are very broad, and the crowns are covered with numerous pointed cusps; these, when worn down, produce a pattern resembling that on the molars of some Ungulates. The upper sectorial is smaller than the first true molar, and semioval in shape, the inner lobe very broad and furnished with three cusps, arranged in a triangle, the inner smaller than the others. The second premolar is very similar to the third or sectorial in shape, and like it has a third

root supporting the inner lobe. The first lower premolar is small and deciduous. There is much resemblance between the dentition of *Ælurus* and that of *Procyon*, though the latter has not the remarkable second upper premolar of the former.

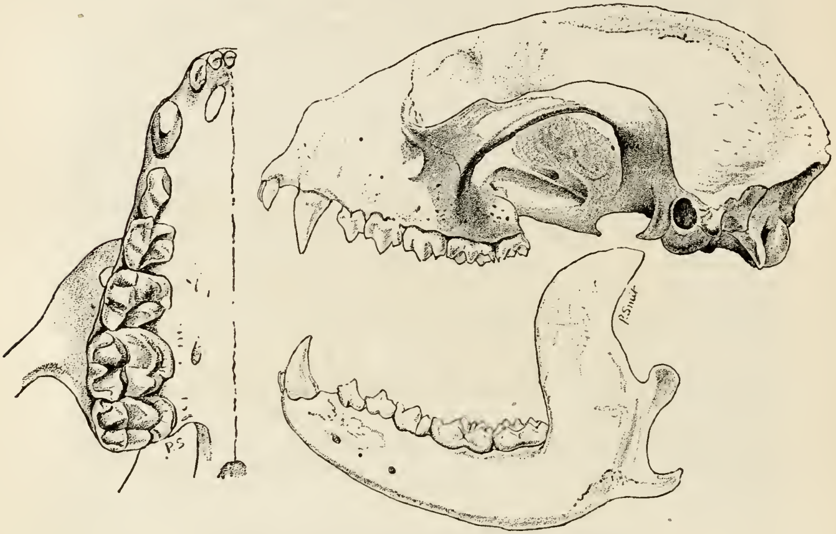

Fig. 50.—Half palate and skull of *Ælurus fulgens*.

The anatomy is described by Hodgson, J. A. S. B. xvi, pp. 1119, 1124, &c., and xvii, pt. 2, pp. 475, 573, and by Flower, P. Z. S. 1870, p. 752. Several important additions are made in the latter paper, and especially the presence of anal glands, which Hodgson thought were wanting, was demonstrated.

96. **Ælurus fulgens.** *The red Cat-bear or Himalayan Racoon.*

Ailurus fulgens, *F. Cuv. Hist. Nat. Mam.* pl. 203 (1825); *Horsf. Cat.* p. 126; *Jerdon, Mam.* p. 74; *Sclater, P. Z. S.* 1869, p. 408; *Simpson, P. Z. S.* 1869, p. 507, pl. xli.
Ailurus ochraceus, *Hodgson, J. A. S. B.* xvi, p. 1118, pls. lii, liii; xvii, pt. 2, pp. 475, 573.
Ælurus fulgens, *Flower, P. Z. S.* 1870, p. 752; *Bartlett, ibid.* p. 769.

Wah, Yé, Nigálya-ponya, Nepal; *Thokya, Thongwa*, Limbu; *Wak-donka, Woker*, Bhotia; *Sankam* (or *Saknam*?), Lepcha.

Tail about two thirds the length of the head and body, or rather more. Fur long and thick, with woolly underfur. Feet and toe-pads completely concealed by hair.

Colour. Back, head above, and tail rusty red, varying in tint, the middle of the back frequently paler, the forehead always lighter in

colour, and several pale rings on the tail, the tip of which is black. Limbs inside and lower parts black, often brownish on the abdomen; soles of feet light brown or whitish. Underfur throughout the body hair-brown. Face and lower lips white, with the exception of a vertical stripe of red from just above the eye to the gape; the ears too are white inside and near the edge outside, remainder of outside surface of ears dark red or black; the hair is red also below the ears behind the white cheek-patches. Claws white.

Fig. 51.—*Ælurus fulgens.* (P. Z. S. 1869, p. 408.) The dark nose-stripe here represented is generally wanting, and the face is white throughout.

Dimensions. A large male measured: head and body 24 inches, tail 17, or with hair at the end 19½; other specimens measured: head and body 20 to 22 inches, tail 16, or with hair 18, the hind foot from the heel 4¼. Weight 7 to 9½ lbs. A large skull is 3·65 inches in basal length, and 3·05 broad across the zygomatic arches.

Distribution. South-eastern Himalayas, from about 7000 to about 12,000 feet elevation. This animal has not been found west of Nepal, but it ranges eastward throughout the mountains north of Assam to Yunnan (Anderson, An. Zool. Res. Introduction, p. xx).

Habits. Hodgson has given a very full account of these, and some useful additions have been made by Dr. Simpson and Mr. Bartlett.

The present animal inhabits forests, and lives in holes of trees, or perhaps amongst rocks. It, however, feeds much on the ground. As a rule it is found in pairs or small families. Its food is almost entirely vegetable, consisting of fruits, acorns, sprouis of bamboo (whence the name Nigálya-ponya), grass, roots, &c. It also eats eggs, and, according to Jerdon, insects and larvæ, though Hodgson says that the individuals kept by him refused similar food (perhaps he did not try the proper kinds). Hodgson also states that it is

fond of milk. All observers, however, agree that it either refuses flesh of all kinds, or takes it very reluctantly. Hodgson tried repeatedly the experiment of putting a live fowl in the cage of an *Ælurus*, which but rarely killed the fowl, and never ate it.

The sharp and powerful semiretractile claws of *Ælurus* are thus manifestly not used for predatory purposes, but are admirably adapted for climbing; and there can be no question that this form, like so many of the Himalayan mammalia, is chiefly arboreal in its habits. It is dull of sight and hearing, and even its sense of smell is not very acute; and, according to Hodgson, it is easily captured, having but little speed, cunning, or ferocity to protect it. It grasps articles, such as fruit, readily with its paws, as observed by Bartlett. Its walk is plantigrade; its movements on the ground slow and awkward. It sleeps sometimes coiled up like a cat or dog, with the bushy tail over the head, sometimes resting on its legs with the head tucked under the chest and between the fore legs, a practice common, it is said, with American racoons, and doubtless due to the habit of resting on a branch of a tree. Bartlett especially notices the resemblance between its habits generally and those of the kinkajou (*Cercoleptes*).

Though by no means distinctly nocturnal, *Æ. fulgens* sleeps much in the day, moving about and feeding in the morning and evening. According to Bartlett it drinks like a bear, by inserting its lips, and not by lapping, though Hodgson says the contrary. Its usual cry, or call-note, is a short faint squeak, said by Dr. Simpson to resemble the chirping of a bird; but when angry it rises on its hind legs like a bear, and attacks with what one observer terms a series of " snorts," and another a " sharp spitting hiss." Jerdon says that a friend of his watched a pair seated high up on a lofty tree, and making most unearthly cries, evidently at the pairing-season.

The period of gestation is not known, but the young are generally two in number, and are produced in spring. They appear to have a long period of helplessness, during which they remain in their place of birth, a hollow tree or hole among rocks, and they remain with the parents until another brood is about to appear.

As a rule these animals appear to be easily tamed even when adult. They are delicate animals, and cannot endure heat, and they also suffer from much cold. When excited, according to Dr. Simpson, a male had the power of emitting a strong odour of musk.

Family URSIDÆ.

The last family of the Arctoidea contains the bears, a very natural group, all of them animals of considerable size, heavily built, thoroughly plantigrade, and with the feet adapted for digging, though not used for fossorial purposes in the same manner as those

of badgers, no bears being known to live in holes dug by themselves.

In this family there are two true molars in the upper and three in the lower jaw, all having broad, flat, tuberculated crowns. The upper sectorial differs from that of other Carnivora in wanting the inner root; the tooth has a small posterior inner lobe without a distinct fang, and looks much like a small true molar. The upper molars are all in one line, the last having its longer axis not transverse, but in the same direction as that of the others. The auditory bulla is very little inflated, its lower surface being almost flat.

Much difference of opinion exists as to the generic subdivisions of the family, but most naturalists place the common Indian bear, or sloth-bear, in a distinct genus from true *Ursus*. The two genera found within Indian limits are thus distinguished:—

Six incisors in the upper jaw .... URSUS.
Four incisors in the upper jaw.................. MELURSUS.

Bears are found throughout the Palæarctic, Oriental, and Nearctic regions, and one species occurs on the Andes in South America; none are known to inhabit Africa south of the Atlas, or Australia.

The remains of one species of bear, *Ursus namadicus*, have been found in the Pleistocene Nerbudda beds of Central India; the species was probably allied to *U. malayanus*. Another form, *U. theobaldi*, of which a skull has been met with in the Pliocene Siwaliks, may have been an ancestral type of *Melursus ursinus*. Besides these traces of three species belonging to the extinct ursine genus *Hyænarctus* occur in the Siwalik beds.

Genus URSUS, Linn. (1766).

Syn. *Helarctos*, Horsfield (1825).

The feet are broad and completely plantigrade, with the soles naked; the five toes of each foot all well developed and armed with long, compressed, and moderately curved, non-retractile claws. Tail very short. Ears small, erect, rounded, hairy. Pupil round. Mammæ 6.

Vertebræ: C. 7, D. 14, L. 6, S. 5, C. 8–10. Skull elongate (except in *U. malayanus*); orbits small and incomplete behind; palate prolonged considerably behind last molars. An alisphenoid canal present. There is a marked projection inside the base of the lower jaw near the angle, as in seals.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{2-2}{3-3}$. The three anterior premolars above and below are small, one-rooted, and frequently wanting; the second especially, in bo h jaws, being generally lost in adult skulls. The upper sectorial is considerably smaller than either of the true molars, which are both longer than broad, with flattened, tuberculated grinding-surfaces, much worn down in old animals. The second is much the larger, and has a large backward prolongation or heel. In the lower jaw the first premolar is

larger and more persistent than the second and third; the lower sectorial has a small and indistinct blade and greatly developed

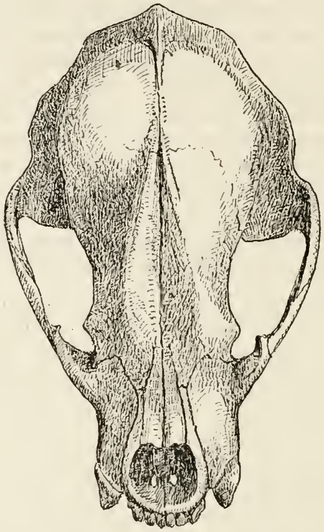

Fig. 52.—Skull of *Ursus malayanus*, young.
(In older animals the breadth is proportionally much greater.)

tubercular heel. The second true molar is about the same length as the lower sectorial, but broader, the hindmost molar is shorter.

Synopsis of Indian, Ceylonese, and Burmese Species.

A. Colour brown; claws brown or white...... *U. arctus*, p. 194.
B. Colour black.
  a. Larger: length over 5 feet; ears 5 to 6 inches long; claws black .... *U. torquatus*, p. 197.
  b. Smaller: length under 4 feet 6 inches; ears about 2 inches long; claws pale .. *U. malayanus*, p. 199.

97. **Ursus arctus.** *The brown Bear.*

Ursus arctos, *L. Syst. Nat.* ed. 12, i, p. 69 (1766).
Ursus isabellinus, *Horsf. Linn. Trans.* xv, p. 332 (1827); *Adams, P. Z. S.* 1858, p. 517; *Blyth, Cat.* p. 76; *Jerdon, Mam.* p. 69; *Lydekker, J. A. S. B.* xlvi, pt. 2, p. 285; *Scully, P. Z. S.* 1881, p. 203.
? Ursus pruinosus, *Blyth, J. A. S. B.* xxii, p. 589; *W. Blanf. J. A. S. B.* xlvi, pt. 2, p. 318.

Barf-ka-rinch, *Lál-bhálú*, H.; *Háput*, Kashmiri; *Drengmo*, Balti; *Drin-mor*, Ladak; *Bralu*, Kishtwar; *Dúb*, Nepal; *Tom-khaina*, Tibetan; *Snow bear* of European sportsmen.

Size large. Claws moderate. Fur long in winter, thick, shaggy, and soft, with woolly underfur, the hair on the back being as much as 8 inches in length; in summer the fur is shorter, thinner and darker. Ears of moderate size, covered with long hair.

Colour. Various shades of brown, from very pale to dark brown, some animals silvery grey from the fur having white tips, some are reddish brown. In the Eastern Tibetan form (*U. pruinosus*) the hair on the back and limbs is blackish with pale tawny tips. The fur is rather paler and greyer at the base. According to Kinloch, as a rule in Kashmir old males are the darkest, young animals and females paler, but there are exceptions. In young animals there is a white half-collar on the breast, and this mark is conspicuous in older individuals on the new fur, when the long winter coat has recently been shed. Claws generally in Himalayan animals pale or white.

Dimensions rather variable, as in all bears, males being larger than females. The Himalayan race (*U. isabellinus*) appears, judging from skulls, to run rather smaller than the European brown bear. Scully gives the length in Gilgit as from 4 feet 8 inches to 5 feet 8; according to Kinloch a very large bear would measure about 7 feet from snout to tail, the latter being only two or three inches long; whilst Adams says the largest he measured, out of hundreds, was 7 feet 6 inches long, and 3 feet 5 inches high. A moderate-sized skull is 11·7 inches long in basal length, and 7·25 broad across the zygomata. The largest skull in the Calcutta Museum measures 12·5 inches by 8·8, a large European skull 13 by 9·5.

Distribution. Throughout the greater portion of the Palæarctic region. The brown bear inhabits the Himalaya from Afghanistan as far east as Nepal, at all events, and is, or was, common in Kashmir and many parts of the N.W. Himalaya, but it does not occur in Ladák, Suru, Zanskár, or any of the districts north of the main range, though common further west in Astor and Gilgit. *U. pruinosus* is found in the neighbourhood of Lhassa.

Synonymy. I can find no sufficient reason for distinguishing *U. isabellinus* from *U. arctus.* Both vary in colour, and are often of the same tint, the Himalayan form, like the Syrian, being as a rule paler than the European, perhaps because the two Asiatic varieties inhabit more open ground. The difference in size does not appear sufficiently great or constant to justify distinction.

Habits. In summer the Himalayan brown bear keeps to high elevations, living chiefly on the grass slopes above the forests, close to the snow; in autumn and spring he is found at lower levels, frequently entering the forests, and descending to the neighbourhood of villages to feed on fruit or grain. In winter these bears retreat to caves, and hybernate or remain in a torpid condition until spring. Their winter retreats are usually, at that season, buried beneath the snow. They reappear about March or April, and in those months and May may be found on open spots on the hill-side, where the snow has melted, feeding on the young sprouts

of grass and herbs, digging for roots and turning over stones to search for insects. Grass, herbs, and roots form their principal food, with the addition of various fruits and seeds found in the forest, or plundered from the neighbourhood of villages. They are fond of apricots, peaches, apples, mulberries, walnuts, and buckwheat, to obtain which they descend into the valleys occasionally when the fruits are ripe, soon returning, however, to the higher slopes near the snow. Sometimes they are said to kill sheep or goats, and they have been known to feed on the flesh of animals they had killed or found dead. Dr. J. L. Stewart (P. A. S. B. 1867, p. 175) records an instance of a large brown bear killing two smaller bears in succession, and eating portions of their bodies. In Europe the brown bear frequently kills and eats animals, it is said even cattle and ponies; but this may be due to vegetable food being less abundant than on the Himalayas, where the brown bear, as a rule, by general testimony is not carnivorous.

Bears are dull of sight and hearing, and although they possess good powers of smell, they appear inferior, even in this respect, to many animals. They can move pretty quickly in a clumsy gallop, but their usual pace is slow. They can climb trees, but in the Himalayas, at all event, rarely do so. The Himalayan brown bear is a very harmless animal, never attacking men, and very rarely, if ever, showing fight even when wounded.

The Himalayan brown bears pair at the end of September, in October and November, and at that time males and females are found together. They, however, go into separate winter-quarters. The young, usually two in number (one with young females), are born in April or May, the period of gestation being about 6 months. Young bears, when born, are very small, scarcely larger than a good-sized rat; they are born hairless and blind, and remain without sight for four weeks; when they are three or four months old they accompany the mother in her rambles. Cubs of two different years are often found with the mother at the same time; all remain with her, as a rule, until nearly three years old, at which time they are full-grown. In Russia it is asserted that a male cub of the previous year takes charge of the young belonging to the next litter, and acts as a kind of nurse; but this may be one of the endless folk-lore stories that have accumulated about bears, as about other formidable Carnivora.

One of these stories is to the effect that bears, when attacking, hug those whom they assail, and squeeze them to death. A "bear's hug" is proverbial. The story is apparently without foundation. A bear, from its anatomical structure, strikes round with its paws, as if grasping, and the blow of its powerful arm drives its claws into the body of its victim, causing terrible wounds, but the idea of its "hugging" appears not confirmed by recent observers.

Bears are easily tamed, and it is not uncommon to see examples of this species led about the plains of India. These animals live to a considerable age; a brown bear lived in the well-known Stadt-

grab at Berne, in Switzerland, for 47 years, and a female after 31 years of age bore young.

98. **Ursus torquatus.** *The Himalayan black Bear.*

Ursus thibetanus, *F. Cuvier, Hist. Nat. Mam.* pl. 213 (1824); *id. Ossemens Foss.* ed. 3, iv, p. 325; *Blyth, Cat.* p. 76; *Jerdon, Mam.* p. 70; *Lydekker, J. A. S. B.* xlvi, pt. 2, p. 285.
Ursus torquatus, *Wagner, Schreb. Säugeth. Supp.* ii, p. 144 (1841).
Helarctos tibetanus, *Horsf. Cat.* p. 124; *Adams, P. Z. S.* 1858, p. 518.
Ursus gedrosianus, *W. Blanf. J. A. S. B.* xlvi, pt. 2, p. 317; *id. P. A. S. B.* 1879, p. 4.

Rinch or *Rich, Bhálu*, H.; *Mam*, Baluchi; *Háput*, Kashmiri; *Sanár, Hing bong*, Nepalese; *Dom*, Bhotia; *Sona*, Lepcha; *Mágyen*, Limbo; *Sutum*, Daphla; *Situm*, Abor; *Mapol*, Garo; *Múphúr, Musu-bhurma*, Kachári; *Vúmpi*, Kuki; *Sawom*, Manipuri; *Húghúm, Thágua, Thega, Chúp, Seván, Sápá*, Naga; *Wek-won*, Burmese.

Size moderate. Fur smooth, not long or shaggy; hair of moderate length, without any woolly underfur; the hair on the shoulders is, however, considerably elongated in winter, giving the appearance of a hump. Claws comparatively short, strong, and curved. Ears rather large and covered with longish hair.

The skull behind the orbits is longer in proportion than that of *U. arctus*, and the muzzle is shorter. The sagittal crest is but slightly developed even in old animals.

Colour. Perfectly black almost throughout, with the exception of the inverted white crescent or horseshoe-mark on the chest which is narrow, with each end prolonged upwards in front of the shoulder. The chin, too, is white, and sometimes the nose is reddish brown, the upper lip being whitish. Occasionally the paws are said to be reddish brown. Claws black.

Dimensions. There is much variation, and males are larger than females. In several measurements of ordinary individuals given by Hodgson, the head and body vary from 4 ft. 8 in. to 5 ft. 5 in., but a very large male measured 6 feet 5 inches from nose to rump. The tail without hair measures 3 to $3\frac{1}{2}$ inches, the hair at the end 1 to $1\frac{1}{2}$ inches more, the planta or sole of the hind foot to the heel $7\frac{3}{4}$ to 9 inches; ear without hair and measured from crown of head 5 to $5\frac{3}{4}$. Weight of full-grown males 200 to 250 lbs. A good-sized adult skull from Nepal is 10 inches in basal length and 6·8 broad. As a rule this is a considerably larger and heavier animal than the sloth-bear of the Indian Peninsula.

Distribution. This bear is found throughout the forest-regions of the Himalayas, extending westward through parts of Afghanistan into Baluchistan and the Khirthar range on the west frontier of Sind. The western limits are about the frontier of Persia. To the eastward *U. torquatus* is found in the Assam ranges and some of the countries to the southward, being certainly found, though not common, in Pegu, where it was obtained by Theobald, and as

far south as Mergui, whence Dr. Anderson obtained living specimens for the Calcutta Zoological Gardens. It also occurs in Southern China, Hainan, and Formosa. Whether the bear found in the plains of Eastern Bengal and Assam is this species or the sloth-bear, I cannot state positively. I once saw a skin of *U. torquatus* obtained from an animal that I was assured had been shot in Lower Bengal; and a writer in the 'Asian' of January 21st, 1888, states that he shot one in the Terai, close to the Patli Dun, North-west Provinces.

Synonymy. The specific name *thibetanus*, although the oldest, must be abandoned, because the animal, although common on the southern slopes of the Himalaya, is never found in Tibet itself. I was misled by a discoloured skin of very small size into giving a new name, *U. gedrosianus*, to the Baluchistan bear; but remarkable as it appears that a Himalayan and Chinese species should inhabit so very different a climate as that of Baluchistan, there appears no sufficient distinction to justify the separation of the bear from the latter country.

Habits. In the Himalayas and throughout its range, except in Baluchistan, the black bear is a forest animal. In the mountains it is found at various elevations from near the base of the hills to about 12,000 feet; usually in summer it ascends to 9000 or 10,000 feet or higher, whilst in winter it descends to 5000 feet or even lower. It is found frequently about villages, and often feeds in fields of grain or in fruit orchards; it has even been known to eat the pumpkins growing on the roof of a house. In winter it subsists largely on acorns. Its food consists mainly of fruits and roots; but whilst it does not dig so much for the latter as the brown bear, it is far more in the habit of climbing trees for fruit, and is not unfrequently found in fruit-trees at night or in the morning. It is also, like most bears, fond of honey, and is said at times to attack the beehives in villages. At the same time it is the most carnivorous of the Indian bears, and not only kills sheep, goats, deer, and even cattle and ponies, but occasionally feeds on carrion.

Some observers state that black bears hybernate, whilst Adams declares they do not. The fact is doubtless, as stated by Kinloch, that they do not hybernate completely as *U. arctus* does, but that they remain in a state of semitorpor, often in a hollow tree, during the cold months, moving about and feeding a little on milder days.

By all accounts the black bear is a much more savage animal than the brown bear, and as the former lives near villages, he more frequently comes in contact with men. Many natives are killed or severely injured by black bears in the Himalayas, and some Europeans; but still it appears an exception for even a wounded bear to charge. This animal is much sharper of sight and hearing than the Himalayan brown bear, and is said by some to have remarkable powers of scent; but by other accounts its sense of smell, though fairly acute, is very inferior to that possessed by deer or especially by wild sheep or ibex. It has the usual walk and quick

but clumsy gallop of the family. It is an excellent swimmer, crossing swollen torrents with ease.

The usual den of this bear is in dense jungle, often in a cave or hollow tree amongst thick bush. As in the case of *U. arctus*, adults are generally found alone except in the pairing-season; but the cubs remain with the mother till full-grown, and those of two seasons are sometimes found with her at one time. This accounts for the parties of four or five bears occasionally noticed. The period of gestation has not been recorded, but is probably the same as in other bears; the young, usually two in number, are born in spring, and are very small, and blind for some time after birth. If captured young they are easily tamed, but are said to be less docile than the other three Indian species, and are certainly less frequently seen in captivity.

99. **Ursus malayanus.** *The Malay Bear.*

Ursus malayanus, *Raffles, Tr. Linn. Soc.* xiii, p. 254 (1822); *Blyth, Cat.* p. 76.
Helarctos malayanus, *Horsf. Zool. Journ.* ii, p. 234; *Cantor, J. A. S. B.* xv, p. 191; *Blyth, Mam. Birds Burma*, p. 30.
Helarctos euryspilus, *Horsfield, Zool. Journ.* ii, p. 221.

Wek-won, Burmese; *Bruang*, Malay.

Size small. Fur short and coarse. Claws well curved. Ears small, rounded, covered with short hair. Tongue very long.

Skull in adults very short and broad, nose short, zygomatic arches wide. Auditory bullæ more swollen than in *U. arctus* or *U. torquatus*. Incisors and canines large, premolars crowded and soon lost. Upper sectorial very small, its transverse section scarcely larger than that of the outer incisor. Molars short and very broad.

Colour. Black, brownish in parts. The muzzle including the eyes and the chin paler, often whitish; the crescentic patch on the chest white, yellow, or orange, with the two ends often broad, sometimes united into a large oval or heart-shaped spot with a black centre, and sometimes with the apex prolonged into a white streak on the abdomen. Claws pale horny, sometimes dusky.

Dimensions. Head and body about 4 feet, tail 2 inches, hind foot 7. The animal may grow to a rather larger size than this, but apparently never exceeds about 4½ feet in length. A full-grown Bornean female only measured 36 inches from nose to rump, tail 1 inch; weight 60 lbs. The ears are quite short, not more than 2 inches long. A very old and large skull is 8·5 inches long (basal length) and 8·3 broad; in younger skulls (fig. 52, p. 194) the breadth is proportionally less.

Distribution. This bear inhabits the Malay Peninsula, Sumatra, Java, and Borneo, and extends northwards into Tenasserim, Arakan, Chittagong, and the Garo hills. Throughout Burma, indeed, I learn from Dr. Anderson, both this and the preceding species

are found. Theobald, in Mason's 'Burma,' doubts if *U. malayanus* is found in Pegu.

Habits. But little known except in captivity. This bear is a purely forest animal and an admirable climber. It is essentially frugivorous, but like other bears occasionally kills and eats animals and birds. It is said to be very fond of honey, and it probably devours insects and their larvæ. Occasionally it is said to attack man. The instances of such attacks mentioned by Dr. Mason in his work on Burma may, however, have been due to *U. torquatus* and not to the present species.

In confinement *U. malayanus* soon becomes very tame if captured young, and from its activity and antics is very amusing. Good accounts of tamed animals are given by Sir Stamford Raffles, and by Col. McMaster in his 'Notes on Jerdon.'

Genus **MELURSUS**, Meyer (1794).

Syn. *Prochilus*, Illiger (1811).

The median pair of incisors in the upper jaw are wanting even in the young. Dentition: i. $\frac{4}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{2-2}{3-3}$. All the molars and premolars very small, the latter separated from each

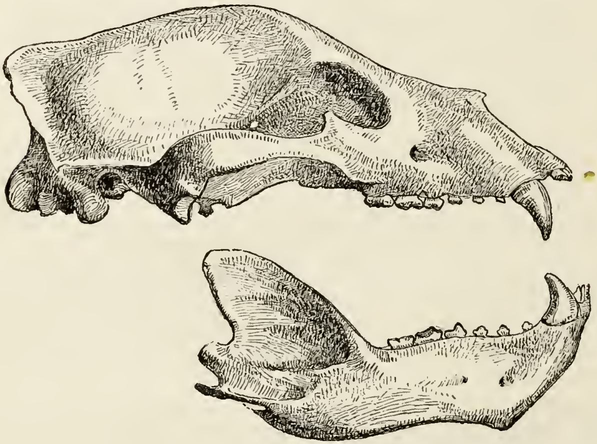

Fig. 53.—Skull of *Melursus ursinus*.

other by a considerable interval. Claws very large and powerful; snout elongate and mobile. Otherwise as in *Ursus*. Vertebræ: C. 7, D. 15, L. 5, S. 5, C. 11.

Only one species is known, and this is peculiar to the Indian Peninsula and Ceylon.

100. **Melursus ursinus.** *The Sloth-Bear or Indian Bear.*

Bradypus ursinus, *Shaw, Naturalists' Miscellany*, ii, pl. 58 (c. 1791).
Ursus labiatus, *de Blainv. Bull. Soc. Philom.* 1817, p. 74; *Sykes, P. Z. S.* 1831, p. 100; *Elliot, Mad. Journ. L. S.* x, p. 100; *Tickell, Calc. Journ. N. H.* i, p. 199, pl. vii; *Blyth, Cat.* p. 77; *Jerdon, Mam.* p. 72.
Ursus inornatus, *Pucheran, Rev. Mag. Zool.* vii, p. 392 (1855).

Rínch or *Rích, Bhalú, Adam-zád*, H.; *Bhalúk*, Beng.; *Riksha*, Sanscr.; *Aswal*, Mahr; *Yerid, Yedjal, Asol*, Gond.; *Bir Mendi*, Oraon; *Bana*, Kol; *Elugu*, Tel.; *Kaddi* or *Karadi*, Can. and Tam.; *Pani Karudi*, Mal.; *Usa*, Cingalese.

Fur long and coarse, longest between the shoulders. In the skull the palate is broad and concave, and extends back farther than in other bears, covering about two thirds of the space between the posterior molars and the hinder terminations of the pterygoids.

Colour. Black, end of muzzle dirty grey; a narrow white horse-shoe-shaped mark on the chest. Claws white.

Dimensions. Head and body 4 ft. 6 in. to about 5 ft. 8 in. long; tail without hair 4 to 5 inches. Males as a rule are larger than females. Height at shoulder 2 ft. 2 in. to about 2 ft. 9 in. Weight of a small female 170 lbs.; large males weigh as much as 20 stone (280 lbs.) or more; I find one in the 'Asian' recorded as weighing 320 lbs. A large male skull is 11 inches in basal length, and 7·8 broad across the zygomatic arches.

Distribution. The peninsula of India from near the base of the Himalayas to Cape Comorin, and Ceylon, chiefly in hilly and jungly parts. To the west this bear is found in Kattywar and has occasionally been met with in Cutch, whilst further north its range appears to be limited by the Indian desert. The eastern limit is more doubtful. The sloth-bear appears to be found, though not commonly, in Eastern and Northern Bengal; but whether the bear of the Assam plains is this species or *Ursus torquatus*, I have not been able to ascertain. Theobald even suggests that the sloth-bear may occur in Pegu, as he possessed a young animal at Toungoo with but four upper incisors.

Habits. An excellent account is given by Tickell, and numerous details have been added by Jerdon, Forsyth, Sanderson, McMaster, and others, from which and my own observations the following notes are drawn up.

The sloth-bear is still one of the commonest wild animals of India, though its numbers have been greatly diminished by sportsmen throughout the country, and in some districts, as in parts of the Deccan and Bengal, where it was common 30 or 40 years ago, it has been exterminated. Wherever it occurs its presence is shown by the holes it digs to get at termites, by marks of its claws on trees that it has ascended for honey, and by its peculiar tracks.

These animals are generally found solitary or in pairs, or three together; in the latter case a female with two cubs, often nearly or quite full-grown. Occasionally four or five are met with in

company. They inhabit bush and forest-jungle and hills, and are particularly fond of caves in the hot season and monsoon, and also when they have young. Throughout several parts of the peninsula of India there are numerous hills of a kind of granitoid gneiss that weathers into huge loose rounded masses. These blocks remain piled on each other, and the great cavities beneath them are favourite resorts of bears, as in such places the heat of the sun, and some of the insects (flies, mosquitoes, &c.) that are most troublesome in the monsoon, can be avoided. In the cold season, and at other times where no caves are available, this animal passes the day in grass or bushes or in holes in the banks of ravines. It roams in search of food at night, and, near human habitations, is rarely seen in the daytime; but in wild tracts, uninhabited by man, it may be found wandering about as late as 8 or 9 o'clock in the morning, and again an hour or even more before sunset in the afternoon. In wet or cloudy weather, as in the monsoon, it sometimes keeps on the move all day. But the sloth-bear, although, like most other Indian animals, it shuns the midday sun, appears by no means so sensitive to heat as might be expected from its black fur, and it appears far less reluctant to expose itself at noonday than the tiger is. I have seen a family of bears asleep at midday in May on a hill-side in the sun. They had lain down in the shade of a small tree, but the shade had shifted without their being disturbed. It is scarcely necessary to observe that this bear does not hybernate.

Owing to its long shaggy coarse fur, its peculiarly shaped head, its long mobile snout, and its short hind legs, this is probably the most uncouth in appearance of all the bears, and its antics are as comical as its appearance. Its usual pace is a quick walk, but if alarmed or hurried it breaks into a clumsy gallop, so rough that when the animal is going away at full speed it looks almost as if propelled from behind and rolled over and over. It climbs over rocks well, and, like other bears, if alarmed or fired at on a steep hill-side, not unfrequently rolls head over heels down hill. It climbs trees, but slowly and heavily, the unmistakable scratches left on the bark showing how often its feet have slipped back some inches before a firm hold was secured. I cannot, however, confirm the statement of some observers that this animal only ascends trees with rough bark; unless I am greatly mistaken I have seen its scratches far up the smooth stems of *kowá* trees (*Terminalia arjuna*).

The food of the sloth-bear consists almost entirely of fruits and insects. Amongst the former the jujube plum or *ber* (*Zizyphus jujuba*), the fruits of the ebony tree (*Diospyros melanoxylon*), *jamun* (*Eugenia jambulana*), *bel* (*Ægle marmelos*), and of various kinds of figs, especially *bar* or *banyan* (*Ficus indica*) and *gúlar* (*F. glomerata*), the pods of *Cassia fistula*, and the fleshy sweet flower of the *mhowa* (*Bassia latifolia*) are much eaten by these animals, each in its season, but many other wild and cultivated fruits are devoured when procurable. Beetles and their larvæ, the honey and young of bees, and above all the combs of termites or

white ants furnish food for the Indian bear. In their nocturnal rambles these animals visit many fruit-trees, sometimes climbing amongst the branches to shake down the fruit, or standing up and dragging it down with their paws; they also turn over stones to search for insects and larvæ, ascend trees to plunder bees' nests, and dig out the nests of white ants, sometimes making holes 5 or 6 feet deep for this purpose. These holes are easily recognized by the marks of the bears' claws.

Tickell says (and his views are confirmed by others):—"The power of suction in the bear, as well as of propelling wind from its mouth, is very great. It is by this means it is enabled to procure its common food of white ants and larvæ with ease. On arriving at an ant-hill the bear scratches away with his fore feet until he reaches the large combs at the bottom of the galleries. He then, with violent puffs, dissipates the dust and crumbled particles of the nest, and sucks out the inhabitants of the comb by such forcible inhalations as to be heard at two hundred yards distance or more. Larvæ, especially the large ones of the *Ateuchus sacer*, are in this way sucked out from great depths under the soil."

In Southern India bears are fond of the fermented juice of the wild date-palm, and climb the trees to get at the pots in which it is collected. The animals are said at times to get very drunk with palm-juice. They are very fond, too, of sugar-cane, and do much damage to the crops; they also occasionally eat various pulses, maize, and some other kinds of corn, and cultivated fruits such as mangoes.

According to Tickell, they rob birds' nests and eat the eggs. I have never heard an authenticated case of their killing larger animals for food, and as a rule they do not touch flesh; but Sanderson records an instance in which a muntjac that had been shot and left in the jungle was partly devoured by one, and he says that they often gnaw dry bones of cattle. McMaster also relates how the body of a bullock that had been killed by a tiger was pulled to pieces and devoured by two large bears. Young cubs reared in confinement eat flesh readily, cooked or raw.

The bears have a peculiar habit of sucking their paws and of making a humming sound at the same time, and the present species is much addicted to the practice. According to Tickell some tame young bears that he saw would suck any person's hand in the same manner as their own paws.

The eyesight of *Melursus ursinus* is by no means good, and it has a peculiarly comical way of peering about for intruders, that gives the idea of its being short-sighted. Its hearing is also, I believe, far from acute. Its sense of smell is much better; by scent it can detect honeycombs in a tree overhead, and nests of termites or larvæ of beetles at some depth below the surface of the ground. In smelling about for food, for instance when visiting fruit-trees at night, it makes a peculiar puffing sound that can be heard at a considerable distance.

Except in puffing and humming, the Indian bears are quite silent animals as a rule, and have no call for each other. Occasionally, however, they make the most startling noise, whether connected with pairing or not I cannot say. I have only heard it in the beginning of the cold season, which is not their usual pairing-time. They occasionally fight under fruit-trees, but I think the noise then made rather different.

When surprised or disturbed, and especially when wounded, a bear is generally very noisy, uttering a series of loud guttural sounds. When hit by a bullet it is far more demonstrative than a tiger; indeed I have more than once known a tiger to receive a bullet without a sound, but I never knew a bear to be hit without much howling. Besides this, when a bear is mortally wounded and lies dying he almost always makes peculiar wailing cries. This has been observed by McMaster.

If two or more bears are together and one is wounded, a fight generally ensues, which Sanderson considers due to an attack by the unwounded animal or animals; but this is not necessarily the case, as I have seen an old female when hit attack two half-grown cubs that were with her, and cuff them heartily, and in one instance, when both of two bears were hit, they stood up on their hind legs and fought till one dropped dead from the bullet-wound.

As a rule the sloth-bear is a timid animal, but occasionally it attacks men savagely, using both its claws and teeth, and especially clawing the head and face. Sometimes, especially when surprised suddenly and attempting to escape, a bear merely knocks a man down with a blow of its claws, often, however, inflicting severe wounds; but in other cases it holds its victim with its claws and bites him severely, not leaving him until some time after he ceases to struggle. Many of the most savage attacks are made by female bears that have young with them, some are by wounded animals, but occasionally the onslaught appears quite unprovoked. The story of sloth-bears hugging is, I think, unknown to the natives of India, and is only repeated by those whose ideas on the subject are derived from European folk-lore.

There are, however, many folk-lore stories connected with the Indian bear. It is a common belief in parts of India that male bears abduct women. It is possible that the name of *Adam-zâd* is connected with this story. The same belief exists in Baluchistan regarding *U. torquatus*.

Sportsmen in India generally either drive patches of jungle or hills, and shoot the bears as they run out, or else mark them down in the morning, and go up to their lair on foot. Elephants are seldom used, they have a great dread of bears, and are but rarely steady with them, and the country is frequently too rough and rocky for the sport. When bears inhabit hills, sportsmen occasionally post themselves before daybreak in a commanding spot, and intercept the animals on their return from their nocturnal rambles. Bears are occasionally speared from horseback, and have sometimes been hunted with large dogs and killed with a knife

when seized. This is described by Sanderson. Jerdon gives an account of a curious method of hunting with dogs, practised by the Polygars, among the hills in the extreme south of the Peninsula. When the bear is brought to bay, the hunters each thrust a long bamboo loaded with strong bird-lime into the shaggy coat of their quarry, and thus hold him firmly. Nets have also been employed.

A wounded bear usually escapes without attempting to fight, and, unless he can get into a cave, runs away until he drops, no matter what the temperature may be, frequently going many miles. Occasionally, however, he charges desperately, but a shot in the face, whether it hits or not, will almost always turn him. There is a common idea, quite unfounded, that a bear always rises on its hind legs to attack, and may then be shot in the chest. It very rarely, if ever, does this when really angry and assailing an enemy already clearly recognized. The act of rising on the hind legs is generally due to surprise, and to an endeavour, on the part of the bear, to make out his enemy better.

The pairing-time appears to vary, but is generally about June, at the commencement of the monsoon. The period of gestation is said by Tickell to be seven months; if so, it rather exceeds that of other bears. The young are born at various times from October till February, but most often in December or January; they are usually two in number, the size of Newfoundland pups, are blind for the first three weeks (18 days according to McMaster), and are covered with soft, short hair, which after a couple of months becomes rougher and coarser. After a time (2 or 3 months I believe) the mother takes them with her, carrying them on her back, where they cling to the long hair. They ride thus, at times, until of tolerable size; one cub may sometimes be seen following its mother whilst the other is carried. They take between two and three years to reach maturity, and generally remain with the mother till full-grown. Sloth-bears have been known to live in captivity for 40 years. They are, when taken young, easily tamed, and, although fretful and querulous at times, generally playful, amusing, good-tempered, and much attached to their masters.

Except *Ursus syriacus* and *U. piscator*, which are probably, like *U. isabellinus*, local races of *U. arctus*, the only other member of the *Ursidæ* found in Asia is the very remarkable *Æluropus melanoleucus*, inhabiting Moupin, in Eastern Tibet. It has one premolar less than *Ursus* on each side of the lower jaw, and there is no alisphenoid canal, but otherwise the skull and dentition do not differ greatly from those of true bears. It is the size of a small brown bear; white, except the ears, a ring round each eye, the shoulders and legs, which are black. The soles of the feet are hairy.

Order INSECTIVORA.

The order next to be considered comprises the tree-shrews, hedgehogs, moles, and shrews, besides several allied groups. A very curious animal called the flying lemur is also included. All are of greatly inferior organization to the Primates and Carnivora, and appear to be less specialized than any other order of placental mammals.

The account of the Insectivora is taken almost entirely from Mr. G. E. Dobson's Monograph, and to that work, in which all Indian forms receive full notice, the reader may be referred for complete anatomical details. The following are some of the principal characters of the order, quoted from the work named.

"Terrestrial, rarely arboreal or natatorial, diphyodont, heterodont, placental mammals of small size, with plantigrade or semi-plantigrade, generally pentadactyle, unguiculate feet, with clavicles (except in *Potamogale*), with more than two incisors in the mandible, and with enamel-coated molars having tuberculated crowns and well-developed roots.

"The extremity of the muzzle projects so far beyond the end of the mandible as to be almost characteristic. The testes are inguinal or abdominal, and are not received into a scrotum; the uterus is two-horned; the placenta discoidal and deciduate; and the smooth cerebral hemispheres do not extend backwards over the cerebellum."

Although the distinction of the teeth into incisors, canines, premolars, and molars is easy in some families, it is, as a rule, much less clear than in the higher Mammalia; and in many cases, as amongst the shrews, the incisors, canines, and anterior premolars can only be distinguished by their position in the jaw; the molar teeth are studded with sharp cusps.

By far the majority of the order are nocturnal, the *Tupaiidæ* being the only exception. The food consists chiefly of insects, except in the case of the aberrant *Galeopithecus*.

By most modern naturalists the Insectivora are divided into two suborders, thus distinguished:—

Upper and lower incisors conical, unicuspidate, or with basal cusps only, the lower not pectinate; limbs free	INSECTIVORA VERA.
Upper and lower incisors compressed, multicuspidate, the lower deeply pectinate; anterior and posterior limbs connected by a broad integumentary expansion, forming a parachute	DERMOPTERA.

It has recently been proposed by Mr. Oldfield Thomas to raise the *Dermoptera* to the rank of an order.

The fossil Insectivora are not very numerous, and none of any importance have been discovered hitherto in India.

Measurements of the smaller Insectivora, as of other micro-mammalia, are mostly from specimens preserved in alcohol.

Suborder *INSECTIVORA VERA.*

This suborder contains the following nine families, four of which are found within the limits of the British Indian Empire:—

A. Upper true molars narrow, with V-shaped crowns (not Indian) ..	**Chrysochloridæ** (Africa). **Centetidæ** (Madagascar). **Solenodontidæ** (West Indies). **Potamogalidæ** (Africa and Madagascar).
B. Upper true molars broad, multicuspidate, with more or less well-defined W-shaped crowns.	
a. Postorbital processes present; a cæcum generally developed; symphysis pubis long.	
a′. Orbital ring encircled by bone; metatarsus moderate: animal squirrel-like, arboreal..	**Tupaiidæ.**
b′. Orbital ring not encircled by bone; metatarsus greatly elongate: terrestrial	**Macroscelidæ** (Africa).
b. Skull without postorbital processes; no cæcum; symphysis pubis short or wanting.	
a′. Crowns of first and second upper molars with a central fifth cusp; bullæ imperfect	**Erinaceidæ.**
b′. No central fifth cusp.	
a″. Zygomatic arches present; bullæ ossified.	**Talpidæ.**
b″. No zygomatic arches; bullæ imperfect..	**Soricidæ.**

Family TUPAIIDÆ.

"Arboreal Insectivora, with comparatively large brain-case, orbits encircled with bone, and well-developed zygomatic arches. The malar bone is perforated, the tympanics form bullæ; the pubic symphysis is long; the tibia and fibula are distinct, the metatarsus but little longer than the tarsus; the molars are broad, with W-shaped cusps; and the intestinal canal has generally a short cæcum." (*Dobson.*)

The animals forming this family have a great similarity to squirrels, which they resemble in the general form of the body and limbs, and in having a more or less bushy tail. They differ from all other Insectivora in being not only arboreal but diurnal in

their habits, feeding by day. They are generally divided into two genera: *Tupaia*, the only form found in India and Burma, and spread throughout the greater part of the Oriental region, and *Ptilocercus*, the pen-tail, which is peculiar to Borneo. By some writers another Bornean species and a Cambodian one are distinguished as *Dendrogale*.

Genus **TUPAIA**, Raffles (1820).

Syn. *Glisorex*, Desm. (1822); *Cladobates*, F. Cuv. (1825); *Hylogale*, Temm. (1827).

The general form remarkably like a squirrel. Limbs well developed; feet naked beneath, the sole furnished with projecting pads, much as in a squirrel, there being especially a long, almost linear projection on the inner sole of the hind foot. Claws moderately curved and sharp. Head pointed; ears rounded. Tail bushy, distichous, clothed with long hair above and at the sides, and with short hair on the lower surface.

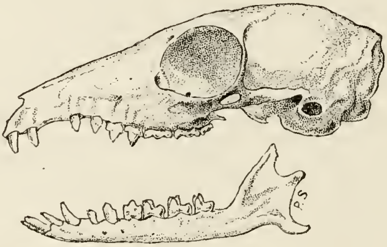

Fig. 54.—Skull of *Tupaia ferruginea*. (Anderson, An. Zool. Res. pl. vii.)

Dentition: i. $\frac{4}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{3-3}$, m. $\frac{3-3}{3-3}$. The first or median upper incisors are at the end of the jaw, widely separated from each other and from the second incisors; the canine, which is similar in size and shape, follows after another even longer interval. The premolars increase in size backwards, the third, and in some species the second, having a well-developed inner lobe. Of the molars the first and second are nearly the same size, the third is much smaller. In the lower jaw the first two incisors are in contact, and project almost horizontally forward; the third is smaller; the canine is variable, being sometimes larger than the incisors, sometimes only the size of the third incisor.

Vertebræ: C. 7, D. 13, L. 5, S. 3, C. 23–26. Mammæ two pairs, one inguinal, the other axillary.

A full account of the osteology, together with descriptions of all the species, is given by Anderson in his 'Zoological and Anatomical Researches.'

Synopsis of Indian and Burmese Species.

A. Colour above speckled throughout; a more or less distinct shoulder-stripe.
  a. Throat and breast nearly white; dorsal fur uniformly coarse .... *T. ellioti,* p. 209.
  b. Throat and breast buff; coarser glossy hairs intermixed in dorsal fur .... *T. ferruginea,* p. 210.
B. Colour of lower back uniformly blackish; no shoulder-stripe .... *T. nicobarica,* p. 212.

101. **Tupaia ellioti.** *The Madras Tree-Shrew.*

Tupaia ellioti, *Waterhouse, P. Z. S.* 1849, p. 107; *Blyth, Cat.* p. 82; *Jerdon, Mam.* p. 64; *Ball, P. A. S. B.* 1874, p. 95, 1877, p. 168; *Günther, P. Z. S.* 1876, p. 426; *Anderson, An. Zool. Res.* p. 124; *id. Cat.* p. 153.

Múnghil anathan (bamboo-squirrel), Tam.

Hair harsh, of uniform length and thickness, without coarser or longer piles.

A small and oval perforation in the malar bone. A well-developed inner lobe to the second upper premolar, forming half the breadth of the tooth. Inner lobe of third upper premolar nearly as wide (from front to back of tooth) as outer lobe. Inner lobe of first and second upper molars as wide as the outer lobe, and with a small cusp at both of the inner angles of each tooth.

Colour. Above yellowish-brown speckled, the middle of the back, the rump, and sometimes the upper surface of the tail, tinged to a variable extent with rusty red. Tail generally the same colour as the back. Lower surface of body nearly white, and a distinct pale stripe from the throat below the ear passing obliquely up in front of the shoulder. Hairs on the upper surface blackish at the base, then pale rufous or dirty white, with a black ring near the end, and the tip black. Hairs of tail with about three pale and three black rings, the basal ring being pale.

Dimensions. Head and body 7 to 8 inches, tail without the hair about half an inch less, with hair 8 to 9 inches, hind foot without claws 1·7; extreme length of skull 1·7, basal length 1·55, zygomatic breadth ·85.

Distribution. Throughout a large part of the Indian Peninsula south of the Indo-Gangetic plain, in forest. This species has been recorded from the Karakpur hills, near Monghyr, the Satpura hills south of the Nerbudda, Matheran near Bombay, Maunbhúm, Sambulpur, Vizagapatam, the Godavary, and the hills between Cuddapah and Nellore (the original locality). I have just received a specimen obtained by Mr. W. M. Daly on the Shevroy hills, but I have not heard of any tree-shrew being found in the forests, either of hills or plains, near the Malabar coast in the Madras presidency, nor in Ceylon.

Habits. This *Tupaia,* like other species, is found in trees in forests, and closely resembles squirrels in its movements. Its food consists of insects and, probably, of fruits. It is easily tamed.

102. Tupaia ferruginea. *The Malay Tree-Shrew.*

Tupaia ferruginea, *Raffles, Linn. Trans.* xiii, p. 256 (1822); *Cantor, J. A. S. B.* xv, p. 188; *Horsf. Cat.* p. 131; *Blyth, Cat.* p. 81; *Günther, P. Z. S.* 1876, p. 425; *Anderson, An. Zool. Res.* p. 130; *id. Cat.* p. 156; *Thomas, P. Z. S.* 1886, pp. 67, 73.
Cladobates belangeri, *Wagner, Schreb. Säugeth. Supp.* ii, p. 42.
Tupaia belangeri, *Günther, P. Z. S.* 1876, p. 426; *Anderson, An. Zool. Res.* p. 126; *id. Cat.* p. 154; *Thomas, P. Z. S.* 1886, pp. 59, 67.
Tupaia peguana, *Lesson, Nouv. Tab. Reg. An., Mam.* p. 93 (1842); *Jerdon, Mam.* p. 65; *Blyth, Mam. Birds Burma,* p. 31; *W. Blanf. J. A. S. B.* xlvii, pt. 2, p. 152.
Tupaia chinensis, *Anderson, An. Zool. Res.* p. 129; *id. Cat.* p. 155.

Kalli-tang-zhing, Lepcha; *Tswai,* Burmese; *Tupai tana,* Malay (Penang).

Fig. 55.—*Tupaia ferruginea.* (From a drawing by Col. Tickell.)

Fur soft, some of the hairs on the back coarser, longer, and distinguished by their lustre.

Perforation in the malar bone moderately large, oval. Inner lobe of second upper premolar variable, being occasionally nearly half the breadth of the tooth, but generally reduced to a very small size, and resembling a cingulum. Inner lobe of third upper premolar about half as wide (from front to back of tooth) as outer lobe. Inner lobes of first and second upper molars narrower than outer lobe, and with a small additional cusp at the posterior, but none at the anterior inner angle.

Colour. Above and on the sides varying from brown with a yellowish tinge to deep ferruginous, always speckled or grizzled, though less distinctly in ferruginous specimens. Tail and outside of limbs nearly the same as the back, except that in some ferruginous specimens the tail is less rufous. A pale oblique stripe, sometimes

indistinct, before each shoulder. Lower parts yellowish buff with more or less of a brownish tinge. Under surface of tail paler. Basal portion (generally half or more) of dorsal fur leaden black, terminal portion of shorter hairs yellowish white or pale rufous, the longer and coarser hairs having beyond the pale ring a long black tip, sometimes with a second subterminal pale ring. Long tail-hairs with alternating subequal rings of black and rufescent white, about three of each, the basal ring pale.

Dimensions. Head and body 6·5 to 7·75 inches, tail without hair 6 to 7, with hair 7 to 8, hind foot without claws 1·7; total length of skull 1·76, basal length 1·56, zygomatic breadth 0·9.

Varieties. By most writers the northern or Burmese race is distinguished, as *T. belangeri* or *T. peguana*, from that found in the Malay Peninsula and Islands, the true *T. ferruginea*, the colour of the former being yellowish brown, of the latter deep rusty brown. There appears, however, to be a passage between the two, many Tenasserim specimens being intermediate in coloration, with the lower back and rump ferruginous. Some differences in the form of the teeth and skull have been pointed out by Anderson and Thomas, but, so far as I can determine, they are not constant. A form from Yunnan and the hills of Upper Burma, near Bhamo, has been separated by Anderson as *T. chinensis*; but I feel doubtful if the characters pointed out (rather smaller size, and smaller teeth) justify specific distinction.

Distribution. Throughout Burma, extending to Assam, and along the lower slopes of the Himalayas, between 3000 and 6000 feet according to Jerdon, as far west as Nepal. To the southward the rufous form extends to the Malay Peninsula, Sumatra, Java, and Borneo. A specimen was obtained by Dr. Stoliczka on the island of Preparis, north of the Andamans.

Habits. This tree-shrew is found in tree-forest, sometimes in bamboos, in bushes, or trees about villages, and in Burma, according to both Mason and McMaster, in houses, living singly or in pairs. Both insects and fruit are eaten by it, and according to the natives of Sikhim small birds and mice. These animals are active, but McMaster considers them much less so than squirrels, and I am disposed to think he is right. Cantor, who appears to have kept several in confinement, states that they sit on their haunches when feeding, "holding their food between their fore legs, and, after feeding, they smooth the head and face with both fore paws, and lick the lips and palms. They are also fond of water, both to drink and bathe in."

According to the same observer, these tree-shrews are pugnacious, driving away all intruders of their own species from their usual hunting-grounds, and fighting each other when confined in a cage. Their call is a "short, peculiar tremulous whistling sound," when angry they utter "shrill protracted cries." Very little is known of their reproductive habits; the female is said usually to have only one young one at a time. They are easily tamed, and become at times, of their own accord, very familiar, entering houses,

climbing on the tables and beds, and helping themselves to any food they may fancy. Mason mentions one that acquired a taste for tea and coffee.

103. **Tupaia nicobarica.** *The Nicobar Tree-Shrew.*

Cladobates nicobaricus, *Zelebor, Novara-Reise, Säugeth.* p. 17, pls. i, ii (1868).
Tupaia nicobarica, *Anderson, An. Zool. Res.* p. 136; *id. Cat.* p. 157.

Fur with some piles longer and coarser than the rest, and highly lustrous.

Skull more elongate than in *T. ferruginea*, but not approaching *T. tana* in this respect. Teeth large.

Colour. Above brownish black on the greater part of the back and tail; the muzzle, a band from the back of the head to between the shoulders, sides of the head and neck, and outside of limbs yellowish golden brown. Lower parts pale brown; lower surface of the tail except towards the base scarcely paler than the upper. No shoulder-stripe. The blackish hairs of the back and tail not annulated; on the brown portions the hair is indistinctly ringed light and dark brown.

Dimensions. Head and body 7·5 inches, tail with hair 10; weight 6 oz. In other specimens (males in alcohol): head and body 7·1, tail without hair 8, hind foot without claws 1·77. Skull of larger male 2·2 long, 1·2 broad.

Distribution. Nicobar Islands; hitherto not found elsewhere. The habits are not recorded.

The largest species of the genus is *T. tana*, found in Borneo. *T. javanica* is a small form that inhabits the Malay Peninsula, as well as the islands, and there are a few other species known.

Family ERINACEIDÆ.

Insectivora with plantigrade feet provided with simple, not fossorial claws, with well-developed radius and ulna, but having the fibula anchylosed below to the tibia, with long slender clavicles and a bifid acromion, with a narrow pubic symphysis, with slender zygomatic arches in which the small malar bones (rarely absent) are suspended, with well-developed pterygoid fossæ, with a ridge and process in front of the orbit, but without postorbital processes, with separate nasals, and with a ring-shaped tympanic bone not forming a bulla. The first and second upper molars with five cusps; the central cusp minute, united by a ridge on each side to the bases of the two internal cusps. The form of these teeth is very characteristic of the family. (*Dobson.*) No cæcum.

This family contains two genera only, differing remarkably in external form, each forming a distinct subfamily, and both occurring

in British India and its dependencies. One of these genera (*Erinaceus*), containing the hedgehogs, is of wide distribution throughout the Palæarctic and Ethiopian regions; but in the Oriental region it is unknown east of the Bay of Bengal, although distributed over a considerable portion of India proper. The other genus, *Gymnura*, is peculiar to the south-eastern part of the Oriental region. All the forms are nocturnal.

The two subfamilies are thus distinguished:—

Back and sides covered with spines; tail very short. *Erinaceinæ.*
Fur without spines; tail well developed.......... *Gymnurinæ.*

Full details of the anatomy of both subfamilies will be found in Dobson's monograph.

Subfamily ERINACEINÆ.

Genus **ERINACEUS**, Linn. (1766).

Back and sides covered with spines; tail very short, without spines; caudal vertebræ rudimentary. Skull short and broad; palate-bones with two large non-ossified spaces posteriorly, in front of a transverse ridge which is just behind the last molars; pterygoid fossæ very broad; no alisphenoid canal; mesopterygoid fossa very deep, and leading posteriorly into a deep hemispherical excavation between the auditory bullæ. Pelvis wide, with the ischial tuberosities not prolonged backwards.

Fig. 56.—Upper jaw of *Erinaceus collaris*. (Dobson, P. Z. S. 1881, p. 403, fig. 11.)

Dentition: i. $\frac{6}{4}$, c. $\frac{1-1}{1-1}$, pm. $\frac{3-3}{2-2}$, m. $\frac{3-3}{3-3}$. The middle pair of upper incisors are considerably larger than the others, and are widely separated from each other; the third incisor and the canine are very similar to each other, and (except in *E. europæus*) two-rooted. The first premolar is also (with the same exception) two-rooted, the second is very variable, the third is much larger and three-rooted. The first molar is the largest tooth in the upper jaw, the second is of smaller size, the third very small.

The median lower incisors are large and conical, and directed

almost horizontally forward, then come on each side three small teeth with oblique cusps, the second of which is the canine and the third the first premolar. The next tooth, or second premolar, corresponds to the fourth lower premolar of *Gymnura*, $\overline{\text{pm. 4}}$; the first molar is, as in the upper jaw, the largest tooth in the jaw, the second being smaller and the third very small.

The vertebral formula is C. 7, D. 15, L. 6, S. 7, C. 5–6.

All the species possess skin-muscles more developed than in any other mammals, and these muscles enable hedgehogs to roll themselves into a ball for defensive purposes, the head and feet being entirely concealed, and only spines exposed.

The spines in all hedgehogs are longitudinally marked with fine grooves (or lirate). In all the Indian species, and in some others, the ridges between the grooves bear small tubercles. On the presence or absence of tubercles Fitzinger divided the genus and called the tuberculate forms *Hemiechinus*, but the character has no generic importance.

Dr. Anderson published, in 1878 (J. A. S. B. xlvii, pt. 2), a very useful monograph of the Indian species. The distribution of the genus in India is peculiar, and confined to the north-western portion (Baluchistan, Punjab, Sind, N.W. Provinces, and neighbouring tracts), and to the Madras Presidency in the south. No species has yet been recorded from the Central Provinces or Bengal.

Synopsis of Indian Species.

A. Spines on head without a naked furrow in the middle; $\underline{\text{pm. 2}}$ three-rooted.
  a. Head and body about 7 inches; longest spines 0·75 inch .... *E. collaris*, p. 215.
  b. Head and body nearly a foot; longest spines exceeding an inch .... *E. megalotis*, p. 216.

B. Spines on head divided into two groups by a naked furrow in the middle.
  a. Colour dark; $\underline{\text{pm. 2}}$ three-rooted .... *E. jerdoni*, p. 216.
  b. Colour pale; $\underline{\text{pm. 2}}$ with a single root.
    a'. Zygomatic arch perfect............... *E. pictus*, p. 217.
    b'. Zygomatic arch imperfect; malar absent *E. micropus*, p. 218.

Very little is known of the habits of Indian hedgehogs, but they probably closely resemble the European form *E. europæus*, except in not hybernating. The European hedgehog lives on insects, worms, slugs, snails, mice, rats, and other small mammalia, lizards, snakes, and any other small animals it can kill, also birds' eggs, fruit, and roots. Blasius states that the young, from four to eight in number, are born in July or August; but Dobson found the number not to exceed four, and believes that the period of gestation does not exceed a month. He shows, too, that a second brood is sometimes produced in autumn. The young at birth are almost naked, but the spines, at first soft, soon harden and grow rapidly, and the animals attain their full growth in about nine months.

104. **Erinaceus collaris.** *Hardwicke's Hedgehog.*

Erinaceus collaris, *Gray and Hardwicke, Illust. Ind. Zool.* i, pl. 8 (1830–32); *Hutton, J. A. S. B.* xiv, p. 351; *Jerdon, Mam.* p. 62.
Erinaceus spatangus, *Bennett, P. Z. S.* 1832, p. 123.
Erinaceus grayi, *Bennett, P. Z. S.* 1832, p. 124; *Anderson, J. A. S. B.* xlvii, pt. 2, p. 204, pl. iv; *id. Cat.* p. 160; *Dobson, Mon. Ins.* p. 17.
Erinaceus blanfordi, *Anderson, J. A. S. B.* xlvii, pt. 2, p. 208, pl. v.

Kánta chua, Kanderna, Sinh, H.; *Khárpúsht, Jujuk,* P.; *Jaho, Tar-java,* Sindhi. These names are also applied to other species of the genus.

Spines of moderate length, commencing behind a line joining the anterior margins of the ears, and not divided on the middle of the head by a naked space. Each spine surrounded by from 21 to 26 finely tuberculated ridges. Ears long, subtriangular, bluntly pointed at the tip. Feet well developed, claws strong; sole of fore foot with a large bifid pad behind, sole of hind foot without any prominent median pad behind opposite the hallux.

Skull short and broad, with a strong and perfect zygomatic arch. Second upper incisor about half the size of the third; second upper premolar well developed, in the same line as the other teeth, subtriangular in section, and furnished with three roots.

Colour dark. Fur on the lower parts and limbs blackish brown to dark reddish brown; the dark hairs on the face mixed with grey or lighter brown; chin whitish, this colour sometimes running along to the mandible and up the sides of the neck, but never forming quite so distinct a collar as in Hardwicke's original figure of the species. Ears usually with short brown hair outside, white inside.

Spines white for the greater part of their length, about the terminal third dark with a narrow white band near the tip, which is black. Occasionally specimens occur in which nearly the terminal half of each spine is black.

Dimensions. Head and body 6·75 inches, tail 1, ears from base 1·3 to 1·5, hind foot without claws 1·2 to 1·5, longest spines 0·75. Total length of skull 1·85 inches, basal length 1·8, zygomatic breadth 1·15.

Distribution. Throughout the Punjab, Sind, and North-western India as far east as Fatehgarh, and probably to Cawnpore, if not further. Unknown except in the plains.

Habits. According to Hutton, who obtained this species in Bahawalpur, *E. collaris* is found in sandy country, hiding in holes beneath thorny bushes or in tufts of grass during the day (I obtained specimens in similar places near Rohri in Sind), feeding chiefly on insects, especially a species of *Blaps*, but also on lizards and snails. It makes a grunting noise when irritated, and when touched suddenly jerks up its back so as to throw its spines forward, making at the same time a sound like a puff from a pair of bellows. Hutton also states that these animals bear long abstinence with apparent ease. Nothing is known of the breeding-habits of any Indian hedgehog.

105. Erinaceus megalotis. *The Afghan Hedgehog.*

Erinaceus megalotis, *Blyth, J. A. S. B.* xiv, p. 353 (1845); xv, p. 170; *id. Cat.* p. 80; *Anderson, Cat.* p. 163; *Scully, A. M. N. H.* ser. 5, viii, p. 223; *Dobson, Mon. Ins.* p. 18.

Size large. Spines long, each surrounded by twenty-seven to twenty-nine faintly tuberculated ridges, the spines on the head not divided by a naked space in the middle. Ears large, triangular. Feet well developed; claws strong; posterior pad of hind foot almost obsolete.

Skull larger than that of *E. collaris*, but otherwise similar. In a Kandahar specimen Scully found that the second upper premolar was two-rooted, but this is exceptional, and due to the two outer fangs being united into one.

Colour dark. Face and ears brown (cinereous according to Hutton), with a few white hairs intermixed; sides of head white, with brown hairs mixed; chin nearly white; lower parts, tail, and limbs dark sooty brown.

Spines brown at the base, then white, succeeded by a faint dusky band (occasionally absent), reaching nearly to the middle, then a broad whitish band succeeded by a narrower dark brown ring, followed by a white band and terminating in a dark brown tip. The dark ring on the proximal (or basal) half of the spine and the longer spines distinguish this form at once from *E. collaris*.

Dimensions. Length of head and body about a foot according to Hutton, tail 1·5 inches, ear from base 1·5, hind foot 1·55, longest spines 1·05; extreme length of skull 2·05 (in another skull 2·3), zygomatic breadth 1·2 (and 1·35).

Distribution. Apparently found throughout a large part of Afghanistan; the type was from Kandahar. This species has been found near Quetta by Hutton, St. John, and others.

Habits. Hutton says:—"They feed on slugs and *Helices*, with which the fields at Kandahar are overstocked; they also prey on worms, insects, and lizards. They hide during the day in holes, and come out in the evening to feed. They retire to hybernate in deep holes in the earth in the end of October or beginning of November, according to the season, and remain in a semi-torpid condition till February, when they again appear."

106. Erinaceus jerdoni. *Anderson's Hedgehog.*

Erinaceus jerdoni, *Anderson, J. A. S. B.* xlvii, pt. 2, p. 209, pl. v *a* (1878); *id. Cat.* p. 165; *Dobson, Mon. Ins.* p. 16.

Spines long, each surrounded by about nineteen tuberculated ridges, those on the forehead commencing between the ears in two belts divided by a nude area along the middle of the head. Ears large, subtriangular. Feet well developed; claws strong; hind foot with a large posterior pad in the middle opposite the hallux.

Skull more elongate than in other Indian species, with a per-

fectly formed zygomatic arch. Second upper premolar well developed, in the same general line as the other teeth, and with three roots.

Colour very dark. The head and the ears outside are grey covered with white and dark brown or black hairs mixed, the inside of the ears white. Chin, throat, and sides of neck whitish; chest whitish brown; remainder of lower parts, limbs, and tail dusky brown, darkest posteriorly.

Spines dusky at the base, then white, followed by a dark band, then another white one, and a long black tip. This is the usual coloration; but on the forehead there are, in some cases at all events, three white and three black rings; again, in some specimens the rings are less numerous than usual.

Dimensions. Head and body 7·5 inches, tail 1·25, ear from base 1·4, hind foot without claws 1·5, longest spine 1·15; extreme length of skull nearly 2, zygomatic breadth 1·1.

Distribution. The Punjab and Sind. The most north-westerly locality recorded is Thal, Karram valley. Specimens from Pind Dadun Khan, referred by Blyth to *E. collaris*, are identified with the present species by Anderson. Other localities are Rájanpur, Rohri, and Karáchi.

Nothing is known of the habits.

A form allied to *E. jerdoni*, but distinguished by its larger size and very long spines, *E. macracanthus*, has been obtained at Kandahar and at Dizak in Persian Baluchistan as well as in Persia, and will in all probability be found in Eastern Baluchistan also *. It is described and figured in 'Eastern Persia,' ii, p. 27, pl. i (see also Scully, A. M. N. H. ser. 5, viii, p. 224). The ears are large and pointed. The spines on the head are divided, and the second premolar three-rooted. The colour of the spines is usually black at the tip and for the terminal third; the basal two thirds brown, with two white rings. The face is covered with black and white hairs mixed; lower parts to breast inclusive white; abdomen brown, becoming blackish behind; tail and all limbs blackish brown. Albino individuals appear common. Head and body 9·5 inches, tail 1·25, ear from base 2, longest spines 1·5, length of skull 2·2.

107. **Erinaceus pictus.** *Stoliczka's Hedgehog.*

Erinaceus pictus, *Stoliczka, J. A. S. B.* xli, pt. 2, p. 223 (1872); *Anderson, J. A. S. B.* xlvii, pt. 2, p. 203, pl. iii.; *id. Cat.* p. 159; *Dobson, Mon. Ins.* p. 13.

Spines commencing on the forehead in front of the ears, and divided by a nude median space on the top of the head; each spine surrounded by seventeen to twenty-two finely tuberculated ridges. Ears rounded, longer than in *E micropus*, and rising,

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* Murray ('Indian Annals,' i. p. 118) states that he has this species from Zandra and Sir-i-Bolán, near Quetta.

when erect, above the spines. Feet small and short, with very short toes; nails small.

Skull short and wide across the zygomatic arches, which are perfect, with a well-developed malar bone. The second upper premolar small, externally situated and single-rooted, but by no means so minute as in *E. micropus*.

Colour pale, identical with that of *E. micropus*. Muzzle, including the eyes, and a band from the eyes to the side of the neck, lower half of fore limbs, lower abdomen, rump, tail, and hind limbs brown; forehead, sides of neck, and underparts to abdomen white. Spines white or yellowish white, with a broad subterminal band brown. Tip white, the extreme point occasionally dusky.

Dimensions. Head and body in males 6 to 7·75 inches, in females 5 to 6, tail 0·5 to 0·8, length of ear from base 1 to 1·4, fore foot 0·7, hind foot 1, longest spine 0·75; extreme length of skull 1·6, zygomatic breadth 1.

Distribution. North-western India, the Punjab, Sind, Cutch, and Rájputána, as far east as Agra and Goona.

Habits. This animal is usually found during the day in holes, such as deserted fox-burrows or under tufts of grass. It appears to be by no means rare in the drier parts of North-western India, but, owing to its nocturnal habits, is but rarely seen. Its food and habits in general are but little known, but doubtless resemble those of other species.

108. **Erinaceus micropus.** *The South-Indian Hedgehog.*

Erinaceus micropus, *Blyth, J. A. S. B.* xv, p. 170 (1846); xxii, p. 582; *id. Cat.* p. 80; *Jerdon, Mam.* p. 63; *Anderson, J. A. S. B.* xlvii, pt. 2, p. 200, pl. v *a*; *id. Cat.* p. 159; *Dobson, Mon. Ins.* p. 14.
Erinaceus nudiventris, *Horsf. Cat.* p. 136.

Mollu-yelli, Tam.

Spines commencing on the forehead in front of a line between the inner angles of the ears and divided by a nude median space on the top of the head. Each spine with seventeen to twenty-two longitudinal minutely tuberculated ridges. Ears rounded at the tip, not rising above the spines. Feet short, with short claws. Hair on lower parts thin.

The skull is distinguished from that of every other species of the genus by the imperfect zygomatic arch, the malar bone being absent and represented by cartilage. The cranium is longer and narrower than that of *E. pictus*. The second upper premolar is exceedingly small, scarcely discernible without a lens, external to the general line of the teeth, and one-rooted.

Colour pale. Muzzle, including the eyes, and a band from the eyes to the side of the neck behind the gape, lower (distal) half of fore limbs, hinder abdomen, and rump, with the hind feet and tail, brown; a broad band on the forehead, sides of neck, throat, chest, and anterior abdomen, with the sides of the body below the spines, white.

Spines white or yellow, with a dark broad subterminal band; tip white.

Dimensions. Head and body 6 inches, tail 0·5, height of ear from base 1 to 1·1, hind foot without claws 1·1, longest spine 0·8. Skull, total length 1·75 inches, basal length 1·65.

Distribution. The plains of Southern India, in the neighbourhood of Madras, Trichinopoly, Coimbatore, &c. Other localities, such as Cottyam, in Travancore, require confirmation, and the repeatedly asserted occurrence of this form on the Nilgiris is shown by Anderson to be incorrect; the animal is, however, found on the eastern slopes towards the base. The northern range of the species is not known, but if any hedgehog be found in the Bombay Deccan, as stated by Adams and apparently confirmed by later observers in the 'Bombay Gazetteer,' it is probably the present species. It is remarkable, however, that none was obtained by Sir W. Elliot in the Southern Mahratta country, and I do not remember ever seeing a hedgehog myself in the Bombay Deccan or the Central Provinces. If, as Kelaart thinks probable, there is a hedgehog in Ceylon, it is most likely to be *E. micropus*.

Nothing especial appears to have been recorded of the habits of this species.

Other Asiatic species of hedgehog are *E. auritus* from Southern Siberia, the Caspian region, and Mesopotamia, and *E. albulus* from Eastern Turkestan.

Subfamily GYMNURINÆ.

Genus **GYMNURA**, Horsf. & Vigors (1828).

Syn. *Echinosorex*, Blainv. (1831); *Hylomys*, Müller and Schlegel (1839).

Fur without spines. Caudal vertebræ numerous and well developed. Head long, and nose pointed; ears rounded; feet and claws well developed; tail nearly naked. Skull long; zygomatic arches very slender; palate-bones completely ossified posteriorly, but with a transverse ridge, as in *Erinaceus*, behind the posterior molars; mesopterygoid fossa not terminating behind in a deep excavation; pterygoid fossæ broad; an alisphenoid canal present. Pelvis very narrow, with the ischial tuberosities much prolonged backwards.

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$, m. $\frac{3-3}{3-3}$. Middle upper incisors much larger than the others, and separated from each other; the next pair are smaller, the outer pair smaller still; all single-rooted. The canine is slightly larger than the first (middle) incisor, and two-rooted. The first two upper premolars are very small, the third varies in the two species; the fourth is large, and has four roots. The molars are similar to those of *Erinaceus*.

In the mandible the lower incisors diminish progressively behind; the canine is larger, and resembles the upper canine, but has only one root; the first two premolars are small, the third larger, the fourth still larger, and higher than the molars, of which the first, as in the upper jaw, is the largest tooth in the jaw, the others diminishing in size progressively.

The vertebral formula differs considerably in the two species. Mammæ two pairs: one thoracic, near the axilla, the other pair inguinal.

Both forms of *Gymnura* somewhat resemble large shrews. Until lately they have been placed in distinct genera, the smaller form being classed as *Hylomys*; but Dobson has united them, and although I feel some misgivings as to their being congeneric, there can be no doubt about their near relationship. Both occur in Burma, but are unknown west of the Bay of Bengal.

Synopsis of Burmese Species.

A. Larger; head and body 12 to 14 inches; tail three fourths that length .... *G. rafflesi*, p. 220.
B. Smaller; head and body about 5 inches; tail one sixth that length............................ *G. suilla*, p. 221.

109. Gymnura rafflesi. *Raffles's Gymnura.*

Viverra gymnura, *Raffles, Tr. L. S.* xiii, p. 272.
Gymnura rafflesii, *Horsfield and Vigors, Zool. Journ.* iii, p. 248, pl. 8 (1827); *Cantor, J. A. S. B.* xv, p. 190; *Blyth, Cat.* p. 81; *W. Blanf. J. A. S. B.* xlvii, pt. 2, p. 150; *Anderson, Cat.* p. 158; *Dobson, Mon. Ins.* p. 3.

Fig. 57.—*Gymnura rafflesi.*

Tail about three fourths the length of the head and body, compressed towards the tip, naked, scaly, the scales small and arranged in rings, between which short hairs project, becoming coarse bristles on the under surface, where the scales are more convex and more distinctly imbricate than above. Ears short, rounded,

almost naked. Body clothed with hair of two kinds, the underfur soft and woolly, the longer hairs coarse bristles. Claws curved, not retractile.

Skull very long and narrow, third upper premolar much larger than the second, and having three roots.

Vertebræ: C. 7, D. 15, L. 5, S. 3, C. 28.

Colour. Partly white, partly black, the distribution of the two colours being somewhat variable; generally the head and neck are white, with the exception of a black patch above and in front of each eye, and often a variable proportion of black bristles is mixed with the white of the crown. The anterior portion of the back is clad with mixed white and black hairs, the proportion varying, the underfur being blackish. On the hinder back, sides, limbs, and lower parts the longer hairs are generally black, but in one specimen from Tenasserim there was a line of white down the middle of the breast and belly. Some Burmese specimens are entirely white. The woolly underfur is dusky olivaceous at the base on the upper parts, ashy on the lower, brownish or sooty black at the tips. Terminal portion of tail usually white.

Dimensions of a Tenasserim female. Head and body 12 inches, tail 8·5, ear 1, hind foot without claws 2·15, extreme length of skull 2·8. But Sumatran, and especially Bornean, specimens are considerably larger, the head and body measuring over 14 inches; skull 3 to 3·5 in length, and 1·6 across the zygomatic arches.

Distribution. The Malay Peninsula, Sumatra, and Borneo. Found in the extreme south of Tenasserim at Bankasun by Mr. Davison. The occurrence of this species in Mergui had already been shown to be probable by Mr. Blyth (see J. A. S. B. xliv, pt. 2, extra number, p. 32).

Habits. Very little is known. The species is purely nocturnal, and lives under the roots of trees. The contents of the stomach show that the food consists of insects, amongst which *Blattæ*, termites, and various forms of larvæ are especially common. The animal has a peculiar offensive smell, not musky, rather alliaceous, described to me by Mr. Davison as resembling Irish stew that had gone bad.

110. **Gymnura suilla.** *The smaller Gymnura.*

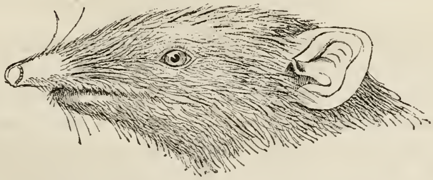

Fig. 58.—*Gymnura suilla.* (Anderson, An. Zool. Res. pl. vi.)

Hylomys suillus, *Müller & Schleg. Verhandl. Mam.* p. 153, pl. xxv, figs. 4–7, pl. xxvi, fig. 1 (1839–44); *Blyth, Mam. Birds Burma,* p. 32.

Hylomys peguensis, *Blyth, J. A. S. B.* xxviii, p. 294; *id. Cat.* p. 82; *Anderson, Tr. Z. S.* viii, p. 453, pl. 64; *id. An. Zool. Res.* p. 138, pl. vi; *id. Cat.* p. 157.
Gymnura suilla, *Dobson, Mon. Ins.* p. 5.

Tail short, one sixth the length of the head and body, almost naked, and covered with small scales arranged in rings. Ears rather larger proportionally than in *G. rafflesi*, rounded, almost naked. Body clothed with hair of three kinds, the inner fine, the longer coarse and bristly. Claws stout, but little curved.

Skull not so long as that of *G. rafflesi*. Third upper premolar

Fig. 59.—Upper teeth of *Hylomys suillus* (Anderson).

scarcely larger than the second. Vertebræ: C. 7, D. 14, L. 6, S. 4, C. 14.

Colour. Above rusty brown, below pale yellowish white; the seminude portions of the limbs and tail brownish yellow. The hairs on the back are tipped with black.

Dimensions. Head and body 4·9 inches, tail 0·9, length of ear 0·6, breadth the same, hind foot 1. Length of skull 1·4, zygomatic breadth 0·75.

Distribution. Burma, Malay Peninsula, Sumatra, and Java. Within our area this animal has been hitherto found in only two localities rather distant from each other—first by Major Berdmore near Shwe Gyeng, on the Sittoung (Sitang) river; secondly by Dr. Anderson on the Kakhyen hills, east of Bhamo, at an elevation of 3000 feet. Probably *G. suilla* exists in many parts of Burma.

Nothing is known of the habits of this species. The above description is taken from that by Anderson, as I have been unable to examine a specimen.

Family TALPIDÆ.

Fossorial, rarely natatorial or cursorial Insectivora, having their fore limbs more or less modified for digging, and very anteriorly placed, owing to the shortness of the clavicles and forward extension of the manubrium sterni, with which they are articulated; with a short humerus articulating with both the scapula and the clavicle; with well-developed radius and ulna, but with united tibia and fibula; without symphysis pubis, the pubic bones being widely separated, while the acetabula are approximated; with elongated skull, provided with slender zygomatic arches and

tympanic bullæ osseæ, but without postorbital processes of the frontals; and with a cæcumless intestinal canal. (*Dobson.*)

Although some non-Indian genera constituting the subfamily *Myogalinæ* are intermediate in form between moles and shrews, the typical moles, which are the only members of the family hitherto found within Indian limits, are easily distinguished by their thick, cylindrical bodies, short legs, and enormous fore feet, and by their peculiar short, soft, velvety fur, the hairs of which are set vertically in the skin, not directed backwards.

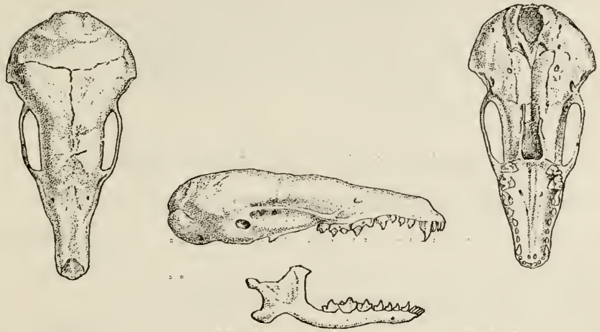

Fig. 60.—Skull of *Talpa europæa.* (Dobson, Mon. Ins. pl. xx.)

The eyes are minute and frequently covered by the skin, the ears short and generally concealed by the fur.

The true molars have always well-defined **W**-shaped cusps, with horizontal internal basal processes. The front incisors above and below are unicuspidate, and the lower are not extended horizontally forward as in the shrews.

The mole family is only found in the Palæarctic and Nearctic regions, and in a small portion of the Oriental region. The peculiar section said by Jerdon to occur in Africa consists of the golden moles, *Chrysochloridæ*, now placed in a distinct family. Nearly all the forms are subterranean in habit and, like most other Insectivora, nocturnal.

Genus **TALPA**, Linn. (1766).

Syn. *Parascaptor*, Gill, 1875.

Form typical. Legs and feet, the anterior pair especially, entirely modified for digging, the fore feet, which are normally turned outwards instead of downwards, being very broad and flat and furnished with large claws; the humerus, radius, and ulna very short and strong, and the clavicle, in some species, as broad as long. The great breadth of the fore feet is partly due to a peculiar development of the proximal inner wrist-bone, or radial sesamoid, which is a large curved ossicle known as the falciform bone (*os falciforme*).

Dentition: i. $\frac{6}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{4-4}{4-4}$ or $\frac{3-3}{4-4}$, m. $\frac{3-3}{3-3}$. The incisors are chisel-shaped, and arranged in a semicircular row, as in most other Mammalia (but not generally in the Insectivora), the median upper pair slightly larger than the others. Upper canines long, conical, double-rooted. Three anterior upper premolars (two in *T. leucura*) small, subequal, double-rooted, the fourth larger, with three roots, followed by three large molars. Lower canines undistinguishable from incisors; first lower premolar large, resembling a canine, the next two small, the fourth again larger.

Vertebræ: C. 7, D. 13, L. 6, S. 5, C. 8–12. Mammæ 6.

Moles are more completely fitted for a subterranean life than any other known mammals, the whole organism being adapted for burrowing. Three species have been recorded from the Himalayas, Khási Hills, and Burma.

Synopsis of Indian and Burmese Species.

Tail subcylindrical, one fourth length of head and body; pm. $\frac{4-4}{4-4}$ .... *T. europæa*, p. 224.

Tail very short, concealed by the fur; pm. $\frac{4-4}{4-4}$ .. *T. micrura*, p. 225.

Tail club-shaped, about one twelfth of total length; pm. $\frac{3-3}{4-4}$ .... *T. leucura*, p. 226.

111. **Talpa europæa.** *The European Mole.*

Talpa europæa, *L. Syst. Nat.* i, p. 73 (1766); *Dobson, Mon. Ins.* p. 137.

Talpa macrura, *Hodgs. J. A. S. B.* xxvii, p. 176; *Jerdon, Mam.* p. 51.

Tail about one fourth to one fifth the length of the head and body, slender, nearly of the same thickness throughout, clad with hair. Feet thinly clad with hair above.

The fourth upper premolar without any distinct internal basal process. The fourth lower premolar decidedly smaller than the first.

Colour. Black, varying to bluish black or sooty black, and occasionally to grey, yellow or even white. The basal portion of the hairs is dark leaden grey, the extreme tips often more or less grey. There is scarcely any difference in tint between the upper and lower parts.

Dimensions. In an adult European male, head and body 5·5 inches, tail 1·35, fore foot and claws 0·9 long, 0·7 broad, hind foot and claws 0·85 long. Basal length of skull 1·25, total length 1·4.

The type of Mr. Hodgson's *T. macrura* measured: head and body 4 inches, tail $1\frac{1}{16}$ without hair, $1\frac{1}{4}$ with, fore foot and nails $\frac{3}{4}$. These measurements were perhaps taken on the skin.

Distribution. The greater portion of the Palæarctic region from England to Japan. There are specimens from the Altai mountains in the British Museum. A solitary example was procured by Mr.

Hodgson at Darjiling. I cannot see any evidence in Mr. Hodgson's description or in his MS. notes, now in the Zoological Society's Library, that he examined this mole in the flesh ; and as not one of the numerous collectors in Darjiling, since Mr. Hodgson's time, is known to have come across a second specimen, I cannot help doubting whether the type of *T. macrura* may not be a European skin, accidentally mixed with Mr. Hodgson's collection. A second specimen in spirits has been found amongst the collections of the Indian Museum, now added to the British Museum, but no locality is recorded. It is worthy of note that, as I am informed by Mr. Oldfield Thomas, a skull from the Altai shows a slight difference in the form of one of the upper molars from European specimens, whereas the supposed Himalayan skull exhibits no such distinction.

Habits. Moles live in burrows dug by themselves, and of complicated form. These have been described by many writers. The abode itself is usually under a hillock, or beneath roots of trees, and consists of a central chamber with passages leading to two circular galleries, one higher in position and smaller in diameter than the other. Several diverging runs lead from the larger gallery, one alone (the main run) being of great length, and conducting to the burrows dug in various directions for the purpose of procuring food. The last are extended daily, and their presence indicated on the surface by small piles of earth, the well-known mole-hills.

The principal food of the mole consists of earthworms, insects and their larvæ, snails and slugs; mice, shrews, and even frogs are also devoured. No animal is more voracious. Males are more numerous than females and fight for the possession of the latter. The pairing-time is about March in Europe, the period of gestation six weeks, and from four to six young are usually produced at once. Moles take to water readily and swim well.

112. **Talpa micrura.** *The short-tailed Mole.*

Talpa micrura, *Hodgs. J. A. S. B.* x, p. 910; *Blyth, J. A. S. B.* xi, p. 95; xix, p. 215, pl. iv, fig. 2 (skull); *id. Cat.* p. 88; *Jerdon, Mam.* p. 51; *Dobson, Mon. Ins.* p. 139.
Talpa cryptura, *Blyth, J. A. S. B.* xii, pp. 177, 928.

Pariam, Lepcha; *Biyu-kantyem,* Bhot.

Tail extremely short, nearly naked, and completely concealed by the fur; caudal vertebræ 8. Feet nearly naked above. Eyes covered by skin.

Fourth upper premolar with a large internal basal process. Fourth lower premolar as large as the first or larger.

Colour uniform velvety black when fresh, with a more or less silvery grey gloss; basal portion of fur leaden grey to leaden black. Dried skins are often brown. Snout and feet whitish or pale flesh-colour.

Dimensions in spirit: head and body 4·75 inches, tail 0·2, fore

foot and claws 0·9, hind foot and claws 0·8. In fresh specimens the head and body measure 5 to 6 inches. Length of skull 1·37 inches. Weight $2\frac{1}{2}$ oz.

Distribution. The south-western Himalayas, especially Nepal and Sikhim, and the hills south of Assam. About Darjiling this animal occurs at a moderate elevation, 5000 or 6000 to 8000 feet,

Fig. 61.—*Talpa micrura.* (From Hodgson's drawings.)

and is common near the station. It may be found at lower levels. Dobson gives Kashmir amongst the localities, perhaps on the authority of Mountstewart Elphinstone ('Caubul,' p. 142); but in this case, and in Kumaon, where also moles have been said to occur (As. Res. xvi, p. 153), it is possible that piles of earth thrown out by *Nesokiæ* have been mistaken for mole-hills. The instances mentioned are quoted by Blyth (J. A. S. B. xi, p. 95).

Habits. Around Darjiling the short-tailed mole inhabits the deep bed of black vegetable mould found wherever the original forest has not been destroyed. This mould contains earthworms and larvæ of insects, the chief food of moles, in abundance. Jerdon noticed that the runs of *T. micrura* often proceeded from the base of one great oak to that of another. Such runs are not marked by mole-hills, as in the case of the European species. Nothing is known of the breeding of *T. micrura*.

113. **Talpa leucura.** *The white-tailed Mole.*

Talpa leucura, *Blyth, J. A. S. B.* xix, p. 215, pl. iv, figs. 1, 1 *a* (skull & tail) (1850); xx, p. 518; xxviii, p. 294; *id. Cat.* p. 88; *id. Mam. Birds Burma*, p. 33; *Anderson, Cat.* p. 170.
Parascaptor leucura, *Dobson, Mon. Ins.* p. 140.

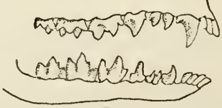

Fig. 62.—Dentition of *Talpa leucura.* (Dobson, Mon. Ins. pl. xx.)

Smaller than *T. micrura*, and muzzle shorter. Tail about one twelfth of total length or rather more, club-shaped, being thicker towards the end than near the base, thinly clad, the hairs coarser and longer than those of the body. Caudal vertebræ 8. Eyes covered.

Upper premolars only three (so that there are six teeth only behind the canine instead of seven as in the other moles), third with a large internal basal process. In the lower jaw the second and third premolars are small and very closely packed, the fourth is equal in size to the first.

Colour uniform brown in all skins I have examined, but described as black by Anderson, perhaps variable. Basal portion of fur leaden black. Tail-hairs whitish or white.

Dimensions. An adult female in spirit measured: head and body $4\frac{1}{8}$ inches, tail $\frac{3}{8}$. Total length of skull 1·2 inches, basal length 1.

Distribution. Sylhet and the Khási and Naga hills, south of Assam; found up to 10,000 feet above the sea. This species was also obtained by Major Berdmore in the valley of the Sittoung river, near Shwegyeng, and probably exists in places throughout Burma.

Nothing is known of the habits of this mole.

Some years since, the Rev. H. Baker found black velvet-coated animals that he took for moles in Malabar (J. A. S. B. xxviii, p. 286); but although it is difficult to say what they were, especially as the feet were mole-like, the coloration (black above, white below) is remarkable in the genus *Talpa*. No animal hitherto described from Malabar coincides with Mr. Baker's description.

Two remarkable genera of *Talpidæ*, each represented by a single species—*Scaptonyx fuscicaudatus* * and *Uropsilus soricipes* †—have been described from Eastern Tibet by A. Milne-Edwards. The first is about the size of a common mole, but with narrower fore feet, the colour is brown. The second is smaller, and has the feet of a shrew, whilst its dentition is somewhat intermediate between a shrew's and a mole's.

Other Asiatic genera are *Myogale*, *Scaptochirus*, and *Urotrichus*.

Family SORICIDÆ.

Terrestrial, rarely natatorial Insectivora, with narrow elongated skulls, without postorbital processes or zygomatic arches. The tympanics are annular, not forming bullæ; there is no symphysis pubis ‡, the tibia and fibula are united; and the molars have well-developed **W**-shaped cusps. (*Dobson.*)

All shrews are covered with hair, generally very soft; the head is long, the eyes small, the snout very pointed and projecting very considerably beyond the lower lip; the ear-conch, when present, rounded and somewhat resembling the human ear in shape. The pointed nose, rounded appressed ears, and the teeth at once distinguish shrews from rats and mice, with which the former are often popularly confounded.

The dentition is characteristic of the family. Dobson has

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* Recherches Mam. p. 278, pl. 38 B, fig. 4, and pl. 40 B, fig. 2.

† *Ibid.* p. 272, pl. 40, fig. 1, and pl. 40 A, fig. 1.

‡ Anderson describes *Anurosorex* as having a short symphysis pubis.

ascertained (Jour. An. Phys. xx, p. 359) that there are no lower canines. The two front teeth in each jaw (median incisors) differ from all the others: in the upper jaw they are curved, and bear a more or less prominent posterior basal cusp; in the lower jaw they are long, they project horizontally forward, and are sometimes slightly curved upwards at the end. Behind the anterior pair of upper incisors come a variable number of small incisors and premolars, amongst which the small canines can be recognized only by their position immediately behind the premaxillary suture, which, however, is only visible in very young animals. The last premolar is large, and there are always three upper molars on each side, the hinder much smaller than the others. There are always 12 teeth in the lower jaw—4 incisors, 2 premolars, and 6 molars; whilst the number in the upper jaw varies from 14 to 20. Some genera are distinguished by having the teeth tipped with brown, in others the teeth are white throughout.

Shrews have the widest distribution of any family of Insectivora, being found throughout the temperate and tropical portions of Europe, Asia, Africa, and North America, with many of the adjacent islands.

The following account of the shrews of India is in great part derived from Mr. Dobson's notes, prepared for the third part (not yet published) of his Monograph of the Insectivora. The classification and most of the synonymy are his, and I am greatly indebted to him for the assistance he has given to me in dealing with one of the most difficult groups of Indian mammals.

A monograph of the Indian forms known to him was published by Blyth in 1855 (J. A. S. B. xxiv, p. 24), and Anderson has published two papers on the subject (P. Z. S. 1873, p. 227, and J. A. S. B. xlvi, pt. 2, p. 261).

The Indian genera of shrews may be thus distinguished:—

A. Teeth tipped with reddish brown .... SORICULUS.
B. Teeth entirely white.
  a. Tail without inferior fringe of white hairs: terrestrial.
    a′. 16 or 18 teeth in upper jaw; ear-conch and tail well developed .... CROCIDURA.
    b′. 14 upper teeth; ear-conch small; tail very short .... ANUROSOREX.
  b. Tail with an inferior fringe of white hairs: aquatic.
    a′. Ear-conch developed.................... CHIMARROGALE.
    b′. Ear-conch wanting .... NECTOGALE.

Genus **SORICULUS**, Blyth (1855).

Terrestrial. Ears small, hairy, more or less hidden by the fur. Tail hairy, but not provided with any scattered long hairs, nearly cylindrical and tapering very gently, greatly resembling that of a mouse. Fur soft and velvety.

Teeth tipped with reddish brown; this wears off to a great extent in old animals and sometimes disappears entirely, but traces can generally be detected: i. $\frac{3-3}{2-2}$, c. $\frac{1-1}{0}$, pm. $\frac{2-2}{1-1}$, m. $\frac{3-3}{3-3}=30$. Middle upper incisors with the anterior cusp bifid, the inner point short

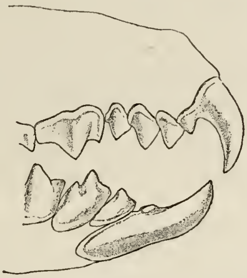

Fig. 63.—Incisors, canine, and premolars of *Soriculus nigrescens*. (Dobson, Mon. Ins., from an unpublished plate.)

and small, lateral incisors and canine subequal in size, anterior premolar minute. Lower anterior incisors elongate, running back beneath the two next teeth and bearing a small projecting knob above, just in front of the next incisor; lower premolar bicuspid.

Vertebræ: C. 7, D. 12, L. 6, S. 5, C. 17. The osteology is briefly described by Anderson in his Catalogue of the Mammalia. He shows that *Soriculus* presents some resemblance to *Talpa*, although the pelvis resembles that of *Crocidura*, not that of *Anurosorex*.

Soriculus is the only representative in India of the brown-toothed shrews, which are, with this exception, confined to the Palæarctic and Nearctic regions, and include *Sorex*, *Crossopus*, and *Blarina*.

Synopsis of Indian and Burmese Species.

A. Second upper incisor smaller than third; tail about half the length of the head and body.. *S. nigrescens*, p. 229.
B. Second upper incisor larger than third.
  a. Length of tail about equal to that of head and body .... *S. caudatus*, p. 230.
  b. Length of tail about half as much again as that of head and body.................. *S. macrurus*, p. 231.

114. Soriculus nigrescens. *The Sikhim brown-toothed Shrew.*

Corsira nigrescens, *Gray, A. M. N. H.* x, p. 261 (1842).
Sorex aterrimus, *Blyth, J. A. S. B.* xii, p. 928 (no description); xxiii, p. 733.
Soriculus nigrescens, *Blyth, J. A. S. B.* xxiii, p. 733; xxiv, p. 36; *Jerdon, Mam.* p. 59; *Anderson, Cat.* p. 204.
Sorex sikkimensis, *Hodgson, A. M. N. H.* ser. 2, iii, p. 203 (1849) (no description); xvi, p. 111 (1855); *Horsfield, Cat.* p. 136.

Sorex oligurus *and* S. holosericeus, *Hodgs. Cat. Mam. &c. Nepal & Tibet B. M.* 2nd ed. 1863, pp. 8, 9 (no descriptions).

Tang-zhing, Lepcha; *Chika*, Newari.

Muzzle thickly furred. Ears small, hairy, completely hidden by the fur. Feet very thinly clad above and scaly. Claws long and straight, especially on the fore feet. Tail varying from one half of the head and body, or rather less, to about three fifths; round (or tetragonal), tapering very gently, thinly covered with short hairs, arising from between small scaly rings. Fur soft, dense, velvety.

The third upper incisor is a little larger than the second, the canine or third single-cusped tooth a little smaller. The minute fourth single-cusped tooth or first premolar is only just visible from the side.

Colour deep glossy brown, almost sooty black in some cases, dark glossy rufescent brown in others, almost the same throughout, scarcely paler below, a greyish tinge on the abdomen; basal three fourths of hairs leaden black. Feet brown above; tail dusky above, scarcely paler below.

Dimensions. In a large female, snout to vent 3·4 inches, tail 1·65, hind foot 0·54; in another specimen these measurements are 3, 1·82, and 0·55. Basal length of skull 0·8.

Distribution. This shrew has hitherto only been found in Sikhim and Nepal. It is common near Darjiling at elevations of about 4000 to 6000 feet, and perhaps higher. I learn from Mr. Dobson that he has received a *Soriculus* from Manipur, possibly referable to this species, but probably distinct, being smaller, with a proportionally longer tail. The genus will doubtless be found in the hills south of Assam.

Nothing is known of the habits of *S. nigrescens*; it is probably a burrower, living in the forest soil.

115. **Soriculus caudatus.** *Hodgson's brown-toothed Shrew.*

Sorex caudatus, *Hodgson, A. M. N. H.* ser. 2, iii, p. 203 (1849) (no description); *Horsfield, Cat.* p. 135 (1851).
Sorex leucops, *Hodgson, Horsf. A. M. N. H.* ser. 2, xvi, p. 111 (1855); *Jerdon, Mam.* p. 56.
Corsira caudata, *Blyth, J. A. S. B.* xxiv, p. 37.
Corsira alpina, *Tomes, A. M. N. H.* ser. 2, xvii, p. 27 (1856); *Blyth, Cat.* p. 86; *Jerdon, Mam.* p. 61.
Sorex homoürus ?, *Hodgs. Cat. Mam. &c. Nepal & Tibet B. M.* 2nd ed. 1863, p. 8 (no description).
Soriculus gracilicauda, *Anderson, J. A. S. B.* xlvi, pt. 2, p. 282.
Soriculus caudatus, *Anderson, Cat.* p. 206.

Body shorter, but limbs longer proportionally than in *S. nigrescens.* Muzzle very thinly clad with hair. All the lower portions of the limbs nearly naked. Hind feet slender. Claws short. Tail long and slender, about the same lengthas the head and body, varying from a little less to a little more, round or tetragonal,

thinly clad with short bristly hairs. Ears hairy, partially hidden in the fur. The second upper incisor is distinctly larger than the third, which again exceeds the canine.

Colour brown, blackish to reddish, basal portion of fur dark leaden black.

Dimensions. Snout to vent, in one specimen, 2·46 inches, tail 2·57; in another, 2·35 and 2·15; hind foot 0·52; basal length of skull 0·66. According to Hodgson's measurements some individuals are as much as 3 inches from snout to vent.

Distribution. Sikhim, near Darjiling, and in the interior of the hills, but not, as Jerdon supposed, at a great elevation, the locality Kedam, whence, in Hodgson's MS. notes, *S. leucops* is said to have been brought, being only 6000 feet above the sea.

116. **Soriculus macrurus.** *The long-tailed Shrew.*

Sorex macrurus, *Hodgson, Cat. Mam. &c. Nepal & Tibet B. M.* 2nd ed. 1863, p. 9 (no description).

Body and limbs slender. Muzzle hairy, well clad. Limbs thinly furred. Tail round, thin, very long, about half as long again as the head and body together, thinly clad with short hair. Ears hairy, partially concealed by the fur, which is long and soft.

Second upper incisor distinctly larger than the third, which exceeds the canine in size in about the same proportion. Anterior upper premolar very small.

Colour uniform blackish brown, basal portion of hairs slaty.

Dimensions of an adult male from Darjiling: snout to vent 2·1 inches, tail 3·4, hind foot 0·57, ear from orifice 0·28, basal length of skull 0·58. Hodgson gives measurements of larger individuals, one 2·75 inches from snout to vent, tail 3·75, another 2·5 and 3·75.

Distribution. The types came from Darjiling; I once picked up in the station a dead specimen, that of which the measurements are given above. Hodgson's types appear to be lost, but his drawings and notes are sufficient for identification.

Genus **CROCIDURA**, Wagler, 1832.

Syn. *Pachyura*, Selys-Longchamps; *Feroculus*, Kelaart.

The head is long, the snout pointed, the sides of the muzzle more or less swollen and covered with numerous long vibrissæ; the nostrils open laterally. The eyes are small and nearer to the orifice of the ear than to the end of the snout. Ears of considerable size. The tail is well developed, and in most species tapering and clothed with short hairs, amongst which are scattered much longer hairs.

On each side of the body there is a gland varying greatly in development in different species, and absent in the females of some. The orifice of this gland is surrounded by short stiff hairs directed

inwards. The secretion has a strong smell of musk and appears to be produced in much greater abundance during the rutting-season. In some of the smaller *Crociduræ*, indeed, the gland cannot be detected at other times.

The genito-urinary and anal orifices both open into a shallow cloaca. There are 6 mammæ, all inguinal, and situated very far

Fig. 64.—Skull of *Crocidura murina*.

back. The sexes are often very difficult to distinguish if the mammæ are not developed, the male organ being retractile and the testes internal. The teeth are white throughout, the total number 28 or 30: i. $\frac{3-3}{2-2}$, c. $\frac{1-1}{0}$, pm. $\frac{1-1 \text{ or } 2-2}{1-1}$, m. $\frac{3-3}{3-3}$. The anterior incisors are strongly hooked and have a basal cusp of moderate size; the next incisor on each side is larger than the two or three following teeth, the first two of which, the third incisor and the canine, do not differ greatly in size: whilst the anterior premolar is small in some species (*Pachyura*), absent in others (*Crocidura*); when present it is the smallest tooth in the jaw. All the teeth enumerated are conical except the first. The second premolar is a broad tooth with several cusps, and approaches the molars in shape.

This genus is widely spread in Asia, Africa, and Europe, and has several representatives in India, but the species are very variable and difficult to discriminate. One principal reason, besides variability, for the large number of nominal species in this genus lies in the fact that it is frequently impossible by external characters, and even by an examination of the teeth, to ascertain whether individuals are adult. The teeth are fully developed and the animals breed freely long before they attain their full growth. Most of the sutures of the skull, too, are anchylosed at an early age, the premaxillary suture (which in most mammals does not disappear before maturity) being closed in shrews at birth or very soon after. The best test of full growth in a shrew's skull is the anchylosis of the basi-occipital suture, lying just between the annular bullæ; the epiphyses of the limb-bones, too, would doubtless serve to show whether an animal is mature or not.

Synopsis of Indian, Ceylonese, and Burmese Species.

A. Four small conical teeth, the hindmost very small, behind each anterior upper incisor. (*Pachyura.*)
- *a.* Size large, rarely in adults less than 4 inches from snout to vent *.
  - *a'.* Ears almost naked, fore and hind claws subequal.
    - *a''.* Feet brown above, hair on their upper surfaces brown .... *C. murina*, p. 233.
    - *b''.* Feet flesh-coloured or yellowish white, naked or clothed with white hair .... *C. cærulea*, p. 236.
  - *b'.* Ears covered with hairs; fore claws twice the size of hind claws .... *C. macropus*, p. 237.
- *b.* Size moderate, snout to vent 2·5 to 3·5 inches.
  - *a'.* The hind foot from heel double the length of the fore foot from wrist .... *C. bidiana*, p. 238.
  - *b'.* The hind foot about 1½ times the length of the fore foot.
    - *a''.* Snout to vent * about 3·4 inches, hind foot 0·64 .... *C. rubicunda*, p. 239.
    - *b''.* Snout to vent about 3 inches, hind foot 0·5 .... *C. leucogenys*, p. 239.
    - *c''.* Snout to vent about 2·75 inches, hind foot 0·6 .... *C. dayi*, p. 240.
- *c.* Size very small, snout to vent rarely exceeding 2 inches.
  - *a'.* Tail more than two thirds the length from snout to vent .... *C. hodgsoni*, p. 240.
  - *b'.* Tail less than two thirds the length from snout to vent .... *C. perrotteti*, p. 241.

B. Three small conical teeth behind each anterior upper incisor. (*Crocidura.*)
- *a.* Tail very thinly clad with hair, scales distinct.
  - *a'.* Snout to vent about 3 inches; tail and feet dark .... *C. fuliginosa*, p. 242.
  - *b'.* Snout to vent 2 to 2¼ inches............ *C. horsfieldi*, p. 242.
- *b.* Tail well clad, scales concealed by the hair.
  - *a'.* Fur dark throughout, or nearly so ...... *C. fumigata*, p. 243.
  - *b'.* Fur of lower surface always pale and often white .... *C. aranea*, p. 244.

117. **Crocidura murina.** *The brown musk Shrew.*

Sorex murinus, *L. Syst. Nat.* ed. xii, p. 74 (1766).
Sorex myosurus, *Pallas, Act. Acad. Petrop.* 1781, pt. 2, p. 337, pl. iv (1785).
Sorex serpentarius, *Is. Geoffroy, Bélanger, Voy. Zool.* p. 119.
Sorex nemorivagus *and* soccatus †, *Hodgson, A. M. N. H.* (1), xv, p. 269 (1845).
Sorex murinus, griffithii, *and* niger, *Horsfield, Cat.* pp. 134, 135.
Sorex kandianus, montanus, *and* ferrugineus, *Kelaart, Prod.* pp. 30, 31.
Sorex saturatior, *Hodgson, A. M. N. H.* ser. 2, xvi, p. 110 (1855).

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* This measurement in shrews is always to the posterior margin of the anal orifice.

† The type sent under this name to the British Museum was *Soriculus nigrescens* (see Blyth, J. A. S. B. xxiii, p. 733, note).

Sorex murinus, serpentarius, soccatus, nemorivagus, heterodon, niger, ferrugineus, *and* montanus, *Blyth, J. A. S. B.* xxiv, pp. 28–32.
Sorex serpentarius, viridescens, soccatus, *and* tytleri, *Blyth, J. A. S. B.* xxviii, pp. 284, 285.
Sorex albinus, murinus, griffithii, serpentarius, soccatus, heterodon, *and* niger, *Blyth, Cat.* pp. 83, 84.
Sorex murinus, nemorivagus, serpentarius, saturatior, tytleri, niger, *and* soccatus, *Jerdon, Mam.* pp. 54, 55, 56, 57.
Crocidura (Pachyura) blythii, pealiana, *and* blanfordii, *Anderson, J. A. S. B.* xlvi, pt. 2, pp. 264–269.
Crocidura murina *and* montana?, *Anderson, Cat.* pp. 180, 193.

Fig. 65.—*Crocidura murina.* (From a drawing by Col. Tickell.)

Teeth in upper jaw 18. Size large, but varying considerably. Snout hairy, not much swollen at the sides. Ears large, rounded, almost naked or thinly clad with short hairs. Feet covered with hair above, the pes or hind foot from the heel about one and a half times the length of the manus or fore foot from the wrist; claws well developed, those of the fore and hind extremities differing but little in size. Tail thick at the base and tapering, varying from $\frac{3}{5}$ to $\frac{2}{3}$ the length of the head and body, thinly covered with short hair, amongst which a few very long hairs are interspersed. Fur of the body rather coarse. Lateral glands well developed, round.

The basal cusp of the anterior upper incisor, the third incisor, and the canine are of very nearly the same size; sometimes the canine is larger than the third incisor, sometimes the two are equal. As a rule, about half of the small first upper premolar is visible from the outside between the canine and the second premolar, but there is some variation. The second upper incisor is approximately of the same height as the middle cusp of the second or large premolar.

Colour either some shade of brown throughout, the lower parts being a little paler and greyer, and the basal portion of the fur dark slaty, or else dark ashy grey, sometimes blackish, with more or less developed ferruginous or brown tips to the fur. The brown form varies from light to very dark blackish brown. The ears, feet, and tail brown, the skin of those parts dusky, not flesh-coloured as in *C. cærulea*.

Dimensions. A large male from Nepal measured from snout to vent 5·5 inches, tail 3·4, height of ear from orifice 0·38, hind foot from heel (claws not included) 0·9. In a large female from Darjiling the corresponding dimensions were 5·3, 3·2, 0·43, and 0·78. In a smaller, perfectly adult, female from Mari (Punjab) the measurements were 4, 2·7, 0·4, and 0·72. With this and other species, it must be borne in mind, as already mentioned in the description of the genus, that immature specimens cannot be distinguished by their external characters.

Varieties. The common Himalayan form (*S. griffithi*, Horsf., and *S. saturatior*, Hodgson) is deep brown in colour, with longer and thicker hair than the form occurring in the plains of India. The latter is often lighter brown in colour (*Sorex tytleri*, Blyth, and *Crocidura blanfordi*, Anderson), but the deep rich brown variety

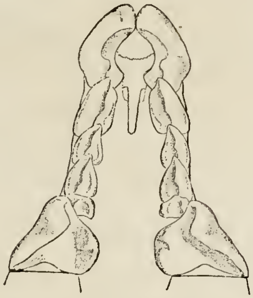

Fig. 66.—Upper incisors, canines, and premolars of *Crocidura murina*, var. *montana*, from below. (Dobson, Mon. Ins., unpublished.)

is prevalent in Burma and the Malay countries and may be considered typical; the most important of the other varieties is the dark ashy grey type (*Sorex serpentarius*, *S. kandianus*, &c.), often with brown or ferruginous tips to the fur (*S. ferrugineus*). A blackish-brown variety has been named *S. niger*. It is possible that some of the names quoted above as synonyms of *C. murina* should have been referred to the next species, *C. cærulea*; but the latter is doubtfully distinct, and there can be no question that intermediate forms (probably hybrids) are met with. The type of *S. nemorivagus*, Hodgson, is an immature specimen. I doubt the distinctness of the small Ceylon shrew called *C. montana* by Anderson, and I am not convinced that it is the same form as *Sorex montanus* of Kelaart.

Distribution. Probably throughout the whole of India, Ceylon, Burma, and the Oriental Region generally; certainly throughout the Himalayas from Kashmir to Assam, up to an elevation of 7000 or 8000 feet, and in many parts of the Indian peninsula and Burma. Specimens are recorded from Calcutta, Ajmere, Khandála near Bombay, Malabar, and Madras, also from Ceylon, Assam, the Khási hills, Arakan, and Tenasserim, besides many parts of the Malay peninsula and archipelago, and from China.

Habits. The brown musk shrew is chiefly found in woods, but occasionally enters houses, and specimens have been captured about stables and similar buildings in some of the Himalayan stations. The musky smell, although very strong in adults, is not, as a rule, so powerful and offensive as that of *C. cœrulea.* The food consists of various insects, larvæ, worms, and probably of any smaller mammal or bird. I have taken one in a rat-trap baited with meat. The natives in parts of India regard this shrew as poisonous, but there is no foundation for the belief.

118. **Crocidura cærulea.** *The grey musk Shrew.*

Sorex cæruleus, *Kerr, An. King.* p. 207 (1792).
Sorex pilorides, *Shaw, Mus. Lever.* ii. p. 31 (1796), *nec* Mus pilorides, *Pallas.*
Sorex cærulescens, *Shaw, Gen. Zool.* i, p. 533 (1800); *Blyth, J.A.S.B.* xxiv, p. 25; *id. Cat.* p. 82; *Jerdon, Mam.* p. 53.
Sorex indicus *and* capensis, *Geoffr. Ann. du Mus.* xvii, pp. 183, 184 (1811).
Sorex sonneratii *and* giganteus, *Is. Geoffr. Mém. du Mus.* xv, pp. 132, 137 (1827).
Sorex myosurus, *Gray & Hardw. Ill. Ind. Zool.* i, pl. ix, *nec Pallas.*
Sorex murinus, *Hodgson, A. M. N. H.* (1) xv, p. 269 (1845); *Kelaart, Prod.* p. 30, *nec L.*
Crocidura (Pachyura) waldemarii, ceylanica, *and* media, *Peters, MB. Ak. Berl.* 1870, pp. 590, 591, 592.
Crocidura (Pachyura) fulvo-cinerea *and* sindensis, *Anderson, J.A.S.B.* xlvi, pt. 2, pp. 263, 266.
Crocidura cærulescens *and* beddomei, *Anderson, Cat.* pp. 171, 179.

Chachundar, H.; *Chundi,* Kol; *Sondeli,* Can.; *Kandeli,* Mal.; *Kunemiyo,* Cingalese; *Anachiwa-gagur,* Kashmiri; *Kywek-tsút,* Burmese; *Musk-rat,* of Anglo-Indians.

Upper teeth 18. This, the common musk shrew (or, as it is usually called, musk-rat) of India, only differs from *C. murina* in larger size and in coloration, and it is very doubtful if either of these distinctions is constant. The fur is short, the tail thick at the base, and both it and the feet very thinly clad with hair, a few scattered longer hairs on the tail.

Colour usually bluish grey, paler below, the fur sometimes with ferruginous brown tips, especially on the hinder part of the back. Occasionally specimens are found of a rufous-fawn tint above, grey below. Young specimens are dark slate-grey. Skin of the snout, ears, feet, and tail flesh-coloured, and hairs on the feet and tail white or nearly white.

Dimensions. A full-grown male measures about 6 inches from nose to vent, tail 3·5, hind foot 1, basal length of skull 1·4. Females are considerably smaller in general. A very large male measured about 7 inches from snout to vent, tail $5\frac{1}{2}$. The tail varies in length considerably.

Varieties. Anderson classes as distinct varieties the form originally named by him *C. sindensis,* which is smaller than the typical

Bengal form, and also the var. *fulvo-cinerea*, from Assam and Arakan, equal in size to typical *C. cærulea*, but fawn-coloured above.

Distribution. India, Ceylon, and Burma, in towns and about human habitations; also in some of the other ports on the Indian Ocean, probably carried thither in ships. There is in the British Museum a specimen of a musk shrew, probably *C. cærulea* or *C. murina*, obtained on board ship by Sir John Kirk.

Habits. It appears doubtful whether this shrew is ever found away from human habitations, and Mr. Dobson has suggested to me the idea that *C. cærulea* is merely, like the cockroaches on which it feeds, a semi-domesticated variety, *C. murina* being the original wild type. I think this view very probable. It is, in some cases, very difficult to determine to which of the two forms specimens should be referred, and in all probability wherever they meet they breed together.

Like all other shrews, the common musk shrew is nocturnal, frequenting houses at night and hunting about rooms for cockroaches and other insects, uttering at times a sharp squeaking cry, and hiding during the day in holes, drains, &c. It is a harmless inoffensive animal, and does much service to man by destroying insects. Its diurnal haunts are liable to smell strongly of the secretion* from the lateral glands, but it does not communicate the smell to anything it merely passes over, unless it is disturbed or frightened.

The food of this shrew consists mainly of insects, but meat is occasionally eaten by it. Sterndale quotes from the 'Asian' an account of one that attacked a large frog, and McMaster met with another feeding upon a scorpion. The latter also relates that he has known this shrew to eat bread. It is commonly accused in India of feeding on rice and pulse; but experiments made by Anderson on individuals kept alive by him showed that they refused to touch any kind of grain, but devoured insects, especially cockroaches, freely, and he found no vegetable food of any kind in the stomachs of several he examined.

I can find nothing recorded as to the breeding-habits of this species. The young are born blind.

119. **Crocidura macropus.** *The long-clawed Shrew.*

Sorex macropus, *Blyth, J. A. S. B.* xx, p. 163 (1851).
Corsira newera ellia, *Kelaart, A. M. N. H.* ser. 2, viii, p. 338 (1851).
Feroculus macropus, *Kelaart, Prod.* p. 32; *Blyth, J. A. S. B.* xxiv, p. 35.

Upper teeth 18. Size moderately large; tail tapering, thinly

* The absurd story that wine or beer becomes impregnated with a musky taste in consequence of this shrew passing over the bottles (a story related with implicit faith, together with many other marvellous fables, by the naturalists of the last century) is less credited in India than it formerly was, owing to the discovery that liquors bottled in Europe and exported to India are not liable to be tainted.

clad, with longer hairs intermixed; feet large, the fore feet with very large claws, which are nearly twice as long as those on the hind feet. Fur moderately long and soft. Ears small, hairy, scarcely visible beyond the fur. Upper surface of the feet hairy.

Lower front incisors slightly serrated above. The dentition generally is very similar to that of *C. murina*.

Colour dark slaty grey above, with rufous-brown tips to the hair of the back, below rather paler; tail and feet dark; in the type specimen the tip of the tail was whitish. Claws white.

Dimensions. Head and body $4\frac{1}{4}$ inches, tail $2\frac{1}{4}$, hind foot with claws $\frac{7}{8}$, claw of middle finger $\frac{1}{4}$ inch long according to Blyth. A not quite mature female in spirit measures:—snout to vent 3·5 inches, tail 2·25, hind foot (without claws) 0·65, middle fore claw 0·2, height of ear from orifice 0·3.

Distribution. This well-marked shrew was first found by Kelaart at Nuwera Ellia, in Ceylon. Recently a specimen has been received at the British Museum from the Palni hills in Southern India.

Habits. Kelaart suggests that *C. macropus* may be a water-shrew; but there is nothing apparent in the structure to support this view. The long fore claws do not appear particularly adapted for digging. A shrew belonging to this species was kept alive by Kelaart for some time and fed upon earthworms.

120. Crocidura bidiana. *Bidie's Shrew.*

Crocidura (Pachyura) bidiana, *Anderson, J. A. S. B.* xlvi, pt. 2, p. 276 (1877); *id. Cat.* p. 185.

Crocidura (Pachyura) stoliczkana, *Anderson, J. A. S. B.* xlvi, pt. 2, p. 270.

Upper teeth 18. This is very like a small *C. murina*, but is distinguished by the pes or hind foot from the heel being double the length of the manus or fore foot from the wrist, instead of only one and a half times the length, as in all allied forms. Ears moderate, round, and rather hairy. Tail long, not much swollen at the base. Fur long, fine, and dense. Through the remarkably wide space between the canine and the second premolar nearly the whole of the small first premolar is visible. There is a small tubercle inside the basal cusp of each anterior upper incisor.

Colour reddish brown above and below, the under surface with a greyish gloss, basal portion of all hairs dark slaty. Snout, ears, and feet pale reddish brown, tail darker.

Dimensions of a nearly adult male: snout to vent 3·2 inches, tail 2·6, hind foot 0·8, height of ear 0·37.

Distribution. The type was from Madras, and a young specimen from Bombay, originally distinguished as *C. stoliczkana*, was afterwards referred to this species by the describer.

The description is taken from Anderson's and from some notes given to me by Dobson. I have not examined the specimens.

121. **Crocidura rubicunda.** *The Pareshnáth Shrew.*

Crocidura (Pachyura) rubicunda, *Anderson, J. A. S. B.* xlvi, pt. 2, p. 277 (1877); *id. Cat.* p. 190.

Upper teeth 18. Size moderate. Snout long, pointed, hairy. Ears large, round, very sparsely haired; rather long white hairs on the flaps. Feet slender, covered with short, nearly white hairs. Tail slightly swollen at the base, round, and rather thinly clad with longish pale yellow, almost white hairs, long white hairs being intermingled. Fur rather long and soft. Lateral gland small, but distinct.

Fig. 67.—Anterior upper teeth of *Crocidura rubicunda.* (Dobson, Mon. Ins., unpublished.)

No tubercle inside the basal cusp of the anterior upper incisor. First premolar largely visible from outside, between the canine and second premolar.

Colour pale rusty fawn above, grey suffused with fawn below, all the basal portions of the hairs dark slaty; muzzle, ears, feet, and tail pale yellowish.

Dimensions of an adult female: snout to vent 3·4 inches, tail 2·3, hind foot 0·64, height of ear 0·33, length of skull 0·93.

Distribution. The only known locality is Pareshnáth hill, east of Hazáribágh, in Bengal.

This species is very nearly allied to *C. bidiana*, but differs in having much smaller and shorter feet. The above description, like the last, is taken from Anderson's and Dobson's notes.

122. **Crocidura leucogenys.** *The white-cheeked Shrew.*

Crocidura leucogenys, *Dobson, A. M. N. H.* ser. 6, i, p. 428 (1888).

Upper teeth 18. Size moderate. Snout hairy. Ears nearly naked. Feet hairy above; claws of moderate size. Tail thick, gradually tapering, covered with hair of moderate length, with longer hairs interspersed. Fur short. A large lateral gland.

The upper canine and second premolar are only separated by a short interval outside, through which a portion of the first premolar is visible. No inner process to basal cusp of first upper incisor.

Colour light sandy rufescent brown above, whitish grey below. Cheeks pale-coloured. Hair nearly the same colour throughout,

that on the back a little paler towards the base. Tail light sandy brown above, whitish below.

Dimensions of the type, an old female with worn teeth : snout to vent 3 inches, tail 2, hind foot 0·5, basal length of skull 0·75.

Distribution. But a single specimen is known; this was obtained by Sir O. B. St. John in Ajmere.

This species is near *C. rubicunda*, but smaller in all its dimensions.

123. **Crocidura dayi.** *Day's Shrew.*

Crocidura dayi, *Dobson, A. M. N. H.* ser. 6, i, p. 438 (1888).

Upper teeth 18. Size rather small. Snout hairy. Ear not large, nearly naked. Feet thinly covered with hair above. Tail long, thinly covered with short hairs (no longer hairs interspersed in the solitary specimen known). Fur long and close.

There is a distinct pointed internal lobe, posteriorly situated, to the basal cusp of each anterior upper incisor. The first or small premolar is (in the type) unusually large, but little inferior to the third incisor in section, though less high; the height, however, exceeds that of the anterior cusp of the second premolar. Lower anterior incisors serrated above.

Colour deep rich brown above, slightly paler and greyer below; the basal two thirds of all hairs blackish. Feet and tail dark.

Dimensions. Hind foot without claws 0·6 inch, basal length of skull 0·67. The length of the head and body in a dried skin is about $2\frac{3}{4}$ inches; tail approximately the same, but no dependence can be placed on these measurements.

Distribution. The only specimen known is a dried skin with a skull in the British Museum. This skin was obtained by Dep. Surgeon-General F. Day in the Madras Presidency, and in all probability from the Palni or Travancore hills.

The hind foot is longer than in *C. leucogenys*, although the skull is smaller.

124. **Crocidura hodgsoni.** *The Himalayan pigmy Shrew.*

Sorex pygmæus, *Hodgson, A. M. N. H.* xv, p. 269 (1845), *nec Pallas.*
Sorex pygmæus, micronyx, hodgsoni, *and* atratus, *Blyth, J. A. S. B.* xxiv, pp. 32, 33, 34; *id. Cat.* p. 85.
Sorex hodgsoni *and* micronyx, *Jerdon, Mam.* pp. 57, 58.
Crocidura (Pachyura) pygmæoides, *Anderson, J. A. S. B.* xlvi, pt. 2, p. 279; *id. Cat.* p. 194.

Chupechi, Bhot.

Upper teeth 18. Size very small, but larger than that of *C. perrotteti.* Ears large, nearly naked. Tail about three quarters the length of the head and body, or more, thinly clad with short hair, amongst which long hairs are scattered. Feet with short hair above. Lateral gland only developed at the rutting-season, when it becomes large.

Colour brown, varying from light sandy to dark and almost black; lower parts paler, the extreme tips of the hairs on the underparts, especially on the throat, greyish.

Dimensions of a large female: snout to vent 1·85 inches, tail 1·4, hind foot 0·37, height of ear 0·2, basal length of skull 0·5. Other specimens are somewhat smaller.

Distribution. Probably throughout the Himalayas and in the ranges south of the Assam valley. I cannot, however, find any locality recorded west of Mussooree. Dobson refers to the same form a specimen of a pigmy shrew from Ajmere, and another from Sind.

125. Crocidura perrotteti. *The Indian pigmy Shrew.*

Sorex perrotteti, *Duvernoy, Mag. Zool.* 1842, p. 29, pl. 47.
Sorex melanodon, perrottetii, *and* nudipes, *Blyth, J. A. S. B.* xxiv, pp. 33, 34; *id. Cat.* pp. 84, 85.
Sorex perrotteti *and* melanodon, *Jerdon, Mam.* p. 58.
Pachyura assamensis, *Anderson, P. Z. S.* 1873, p. 234.
Crocidura (Pachyura) macrotis, nitidofulva, nilgirica, *and* travancorensis, *Anderson, J. A. S. B.* xlvi, pt. 2, pp. 271–275.
Crocidura macrotis, perrotteti, *and* travancorensis, *Anderson, Cat.* pp. 186–189.

Upper teeth 18. Size very small. Ears large, covered with very short hair. Feet thinly clad above. Tail not swollen at the base, thin, tapering towards the end, about two thirds the length of the head and body, or rather less, sparsely covered with very short hairs, amongst which longer hairs are scattered. Fur short. Lateral glands well developed.

Colour reddish brown to dark brown, nearly black above, paler and greyer below. Tail dark above, light-coloured beneath.

Dimensions of an adult male: snout to vent 1·78 inches, tail 1·12, hind foot 0·35, height of ear from orifice 0·15, basal length of skull 0·45.

Distribution. Southern India, especially the Nilgiri hills and Travancore, Bengal, Assam, and Tenasserim. Not reported from Ceylon.

Habits. Nothing has been recorded about this, one of the very smallest of all Mammalia. In a female Anderson found five fœtuses.

This species Dobson considers doubtfully distinct from the South European *C. etrusca.* I cannot help suspecting either that *C. hodgsoni* is not really different from *C. perrotteti*, or else that the number of Indian pigmy shrews must be more than two. The geographical distribution of these two forms, as given above, is quite anomalous.

Another shrew belonging to the section with 18 upper teeth has been described by Anderson under the name of *C. subfulva* (J. A. S. B. xlvi, pt. 2, p. 278; Cat. p. 192). The types are, however, immature, and it is quite uncertain what the adults may prove to be. Two specimens were found in Cutch by Dr. F. Stoliczka; the

older of the two measures: snout to vent 1·9 inches, tail 1·3, hind foot 0·42, basal length of skull 0·62. Colour pale fawn above, silvery grey below.

126. **Crocidura fuliginosa.** *Blyth's Shrew.*

Sorex fuliginosus, *Blyth, J. A. S. B.* xxiv, p. 362; *id. Cat.* p. 84.
Crocidura rubricosa *and* kingiana, *Anderson, J. A. S. B.* xlvi, pt. 2, pp. 280, 281.
Crocidura rubricosa *and* fuliginosa, *Anderson, Cat.* pp. 196, 197.

Upper teeth 16. Size rather small. Muzzle thinly clad. Ears large, nearly naked. Feet thinly clad above. Tail long, three fourths the length of the head and body, or more, subcylindrical, very gently tapering (except in the rutting-season, when the basal

Fig. 68.—Anterior upper teeth of *Crocidura fuliginosa.* (Dobson, Mon. Ins., unpublished.)

portion is thickened), nearly naked, being thinly clad with very short hair, amongst which a few longer hairs are interspersed in the basal half only. Lateral gland small and elongate, present in the male only. The small first premolar is wanting, but otherwise the teeth, though much smaller, are similar to those of *C. murina.*

Colour deep rich reddish brown above, ashy brown to ashy grey below, basal half of fur throughout slaty. Tail and upper surface of feet dark brown.

Dimensions. An adult male measures: snout to vent 3·1 inches, tail 2·7, hind foot 0·55; an old female, 2·9, 2 5, and 0·57. Basal length of skull in each 0·75.

Distribution. Eastern Himalayas, at an elevation not exceeding 5000 or 6000 feet, Assam, and Tenasserim. Common in Sikhim.

127. **Crocidura horsfieldi.** *Horsfield's Shrew.*

Sorex horsfieldi, *Tomes, A. M. N. H.* ser. 2, xvii, p. 23 (1856).
Crocidura retusa, *Peters, MB. Akad. Berl.* 1870, p. 585; *Anderson, Cat.* p. 199.

Upper teeth 16. Size small. Muzzle thinly clad. Ears of moderate size, nearly naked. Feet thinly clad above; of the proximal pair of pads on each hind foot the outer is further from the heel. Tail thick at the base and tapering, but little shorter than the head and body, thinly clad with short hair, a few longer hairs interspersed in the basal half only. Lateral gland large, nearly circular, present in both sexes, but less developed in females than in males.

Colour bright ferruginous brown above, light yellowish grey below, basal portion of the fur light grey. Some specimens are reddish brown above, light brown below, with the basal portion of the hairs slaty. Feet and tail flesh-coloured in many cases, but dusky in others.

Dimensions. Snout to vent in a large female 2·25 inches, in a male 2·1, tail 2 and 1·95, hind foot 0·45, basal length of skull 0·6.

Distribution. This species has hitherto only been found in Ceylon, where, however, it escaped the notice of Kelaart. Specimens have been sent from Paradinia, so this form is probably an inhabitant of the hills. It should be looked for in the Travancore ranges also.

128. **Crocidura fumigata.** *De Filippi's Shrew.*

Sorex (Crocidura) fumigatus, *De Fil. Arch. per la Zool. Genova,* ii, p. 379; *id. Viag. in Persia,* p. 343; *Blanford, Eastern Persia,* ii, p. 24.

Upper teeth 16. Size small. Muzzle thickly clad with hair. Ears of moderate size, nearly naked. Feet thinly clad above, proximal pair of pads on hind foot parallel in the only specimen I have access to, that from Simla; in all other species the outer of the two is much more distant from the heel. Tail remarkably thick in the male, thin in the female, about two thirds the length of the head and body, well clad with coarse hair of moderate length throughout, with long fine hairs interspersed on the basal half. A small pencil of hair at the end of the tail. No lateral gland has been detected.

Colour reddish brown above, greyish brown below, basal portion of fur on both surfaces slaty. Tail dark brown throughout, feet paler brown above.

Dimensions. Snout to vent 2·75 inches, tail 1·9, hind foot 0·55.

Distribution. Originally described from Northern Persia. Mr. Dobson tells me he has seen specimens from Kiangsi, and he has identified with this form a shrew sent to me by Mr. Hume from Simla.

129. **Crocidura aranea.** *The spider Shrew.*

Sorex araneus, *L. Syst. Nat.* ed. xii, p. 74, *partim*; *Schreber, Säugeth.* iii, p. 573, pl. 160.
Sorex russulus *and* leucodon, *Herm. Zimm. Geog. Gesch.* ii, p. 382.
Sorex myoides, *Blanford, J. A. S. B.* xliv, pt. 2, p. 106; *id. Yark. Miss., Mam.* p. 16, pls. i, i *a*.

Upper teeth 16. Snout, upper surface of feet, and tail fairly clad with hair, the latter not swollen at the base, nearly cylindrical, about half as long as the head and body, or rather more, covered with rather short hair, with a few long hairs intermixed. Lateral gland small and elongate in males, wanting in females.

Colour brown above, usually fawn-coloured or greyish brown;

below pale grey or white; fur slaty at the base throughout; upper surface of tail darker than the lower.

Dimensions of an adult Ladák female: snout to vent 2·1 inches, tail 1·5, hind foot 0·5, extreme length of skull 0·75.

Distribution. Central and Southern Europe, Northern Africa, and Central Asia, extending to North-eastern Siberia. It has been obtained in Ladák.

Habits. In Europe this shrew is commonly found about cultivated ground and is often met with in houses. It lives on insects, worms, young mammals of small size, and young birds, and will eat meat and fat. It has from 5 to 10 young, which are born in summer, and which attain their full growth in about 6 weeks.

Sorex kelaarti, Blyth, J. A. S. B. xxiv, p. 32; Cat. Mam. p. 84 (*Crocidura kelaarti*, Anderson, Cat. Mam. p. 200), is founded, Mr. Dobson informs me, on a very young female, with the teeth imperfectly grown, although the inguinal teats are fully developed. Despite the circumstance that there are but 28 teeth, this shrew may be a young specimen of *C. murina*. The small premolars are wanting in a half-grown skull of that species from Darjiling.

Genus **ANUROSOREX**, A. Milne-Edwards (1870).

Syn. *Pygmura*, Anderson (1873).

Head large in proportion to the body. Eyes very small. No external ear-conch; ears valvular. Feet short, scaly. Tail very short, naked, and scaly. Fur dense, velvety.

Teeth entirely white; there are 14 in the upper jaw, only two conical teeth lying between the upper anterior incisor and the single multicuspidate premolar on each side: i. $\frac{2-2}{2-2}$, c. $\frac{1-1}{0}$, pm. $\frac{1-1}{1-1}$, m. $\frac{3-3}{3-3}=26$.

A full description of the skull and skeleton is given by Anderson (An. Zool. Res. p. 151). The structure of the pelvis shows some resemblance to that of *Talpa*.

Two species are known, one of which occurs in Assam.

130. **Anurosorex assamensis.** *The Assam short-tailed Shrew.*

Anurosorex assamensis, *Anderson, A. M. N. H.* 1875, ser. 4, xvi, p. 282; *Anat. Zool. Res.* p. 150, pl. v, figs. 1–16 (skeleton); *id. Cat.* p. 171.

Snout semi-nude. Feet naked, scaly, the hind foot from the heel $1\frac{1}{2}$ times the length of the fore foot from the wrist. Tail about one-sixth the length of the head and body, naked and scaly. Numerous thicker hairs project beyond the velvety fur, which is nearly erect on the skin (as in moles), and is longest on the rump, so as to conceal the greater part of the tail.

The skull is nearly half as long as the vertebral column from the atlas to the end of the sacral vertebræ. There is a distinct inner

talon to the basal cusp of each upper anterior incisor. The outer upper incisors are larger than the canines. The anterior lower incisors are long and their points turn upwards; they are not serrated above.

Colour dark slaty, faintly washed with brownish rusty on the hairs of the rump; the longer hairs brown, with obscure pale tips. Snout, limbs, and tail flesh-coloured; claws yellow. The fur exhibits violet iridescence when wet.

Dimensions of a female: snout to vent 2·92 inches, tail 0·5, basal length of skull 0·92. Another specimen is 3·1 inches from snout to vent, tail 0·5, hind foot without claws 0·62.

Distribution. The only specimens known (a female and young) were obtained by Mr. S. E. Peal between Sibságar and Jaipur, in Assam.

Habits. This is probably from its structure a burrower, with habits similar to those of a mole.

An allied species, *A. squamipes*, the type of the genus, occurs in Eastern Tibet and Se-chuan. In this the tail is still shorter than in the Assam form.

Genus **CHIMARROGALE**, Anderson (1877).

Form adapted for an aquatic life. Ear-conch present but small. Feet scaly, broad, with a fringe of short coarse flat white hairs along their margins and on each side of every toe. Toes not

Fig. 69.—Anterior upper teeth of *Chimarrogale himalayica*. (Dobson, Mon. Ins., unpublished.)

webbed. Tail long, the under surface covered with white hairs, similar to those that fringe the feet.

Teeth white. Dentition: i. $\frac{3-3}{2-2}$, c. $\frac{1-1}{0}$, pm. $\frac{1-1}{1-1}$, m. $\frac{3-3}{3-3}=28$, as in *Crocidura*.

Two species are known, one being found in the Himalayas. The osteology is described by Anderson in his 'Anatomical and Zoological Researches.'

131. **Chimarrogale himalayica.** *The Himalayan Water-Shrew.*

Crossopus himalayicus, *Gray, A. M. N. H.* x, p. 261 (1842); *Blyth, J. A. S. B.* xxiv, p. 37; *Jerdon, Mam.* p. 60.
Crocidura himalaica, *Anderson, P. Z. S.* 1873, p. 231.

Chimarrogale himalayica, *Anderson, J. A. S. B.* xlvi, pt. 2, p. 282; *id. An. Zool. Res.* p. 130, pl. v, figs. 17–30 (skeleton); *id. Cat.* p. 208.

Ung lagniyu, Lepcha; *Chupitsi*, Bhutia.

Snout densely furred and with numerous vibrissæ. Eyes very minute. The small ear-conch is hairy and entirely concealed by the fur. Feet scaly; toes naked; upper surface of metacarpus and metatarsus thinly clad with short flat bristly hairs. Tail thinly clad above, thickly below, with short flat hairs. Fur soft and dense, with a few longer hairs on the back and sides, becoming numerous on the rump.

Upper anterior incisors each with a lateral expansion on the inner side of the anterior cusp so as to meet, the proximal surface of the cusp being concave; the notch between the anterior and basal cusp very deep. The three intermediate conical teeth on each side nearly of equal size. Premolar about equal in section to the anterior molar, and having the inner ridge of the crown divided into two cusps. In the lower jaw the anterior incisors are elongate and much turned up at the end, and the crown of the premolar distinctly bifid at the summit.

Colour dark slaty grey above, with the tips of the hairs rich blackish brown, the terminations of the scattered longer hairs shining white. Lower parts pale brownish grey, basal portion of hair ashy grey below, dark leaden grey above. Hair on the upper surface of the feet brown. Tail dark brown above, white below.

Dimensions. An adult female measured: snout to vent 4·35 inches, tail 3·05, hind foot without claws 0·75, height of ear from orifice 0·27. Jerdon gives larger measurements, head and body 5 and 6 inches, and I possess skins that measure this. The skull of a small female measured 0·94 inch in basal length.

Distribution. South-eastern Himalayas, and the Khakhyen hills north of Burma, at elevations, so far as is known, of from 3000 to 5000 feet. Not recorded further west than Sikhim, where it is not rare.

Habits. The Himalayan water-shrew inhabits the banks of streams, and has been observed by Anderson running over the stones in the stream-bed and plunging freely into the water. It doubtless swims well. It is said to feed on water insects, aquatic larvæ, tadpoles, small fish, &c., like *Crossopus fodiens* of Europe.

The other species of this genus, *C. platycephalus*, inhabits Japan. A black shrew was noticed swimming in water by Col. McMaster near Nagpur, but no specimen collected (see 'Notes on Jerdon's Mammals,' appendix, p. 215). The animal is probably an undescribed form.

Genus **NECTOGALE**, A. Milne-Edwards (1870).

Aquatic. No external ear-conch; ears valvular. Feet large, broad, scaly, fringed with coarse white hairs; toes webbed; pads

on the soles of the feet enlarged into broad disks. Tail long, with fringes of white hairs on the sides and lower surface and on the terminal portion of the upper surface; last third of tail compressed.

Teeth white: i. $\frac{3-3}{2-2}$, c. $\frac{1-1}{0}$, pm. $\frac{1-1}{1-1}$, m. $\frac{3-3}{3-3}=28$, as in *Crocidura*.

This is a more thoroughly aquatic form than its near ally *Chimarrogale*. Only one species is known.

132. Nectogale elegans. *The Tibetan Water-Shrew.*

Nectogale elegans, *A. Milne-Edwards, Comptes Rendus*, lxx, p. 341 (1870); *id. Rech. Mam.* p. 266, pls. 39, 39 A; *W. Blanford, P. A. S. B.* 1875, p. 198.

Eye very small. Snout covered with fur as thick as that on the body. Hind feet large and broad, double the length of the fore feet, naked above, only the terminal phalanges free from the web and fringed with hairs like those on the sides of the feet, white, coarse and flattened, and nearly $\frac{1}{10}$ inch long, or twice the length of those in *Chimarrogale*. A few scattered coarse hairs on the upper surface of the metacarpus. Hair fringing the fore feet short, and no fringes to the toes, but the disks beneath the sole are similar to those on the hind feet. Tail well clad above with short flat hairs, densely clad with similar flat hairs below, which form fringes. There is one along each side of the basal third of the tail, the two unite and form a median inferior fringe for the remaining two thirds, along each side of which is a lateral fringe, dying out towards the end, where the tail is distinctly compressed, whilst on the terminal portion there is an upper median fringe. Fur extremely dense, soft, and long, evidently adapted for a cold climate, with conspicuous longer hairs on the back and sides, becoming most numerous on the rump.

Colour rich dark brown above, the longer hairs glistening white; upper lip, chin, throat, and breast whitish, passing into light brown on the abdomen and flanks, but the line of division well marked in front of the fore limbs. Tail whity brown above, white below. The fur when wet is iridescent.

Dimensions. Head and body 3·6 inches, tail 4, hind foot 1, extreme length of skull 1.

Distribution. Tibet. First found by Père David in Eastern Tibet, then a specimen was procured by Mr. Mandelli from the Sikhim frontier. I once saw a small mammal, probably this species, swimming in a deep stream at 15,000 feet above the sea, near Momay Samdong in Sikhim. This shrew is evidently an inhabitant of high elevations, and may hereafter be found in other parts of the high Himalayas and Tibet.

Habits. Evidently *Nectogale*, from its structure, is thoroughly aquatic. The enlarged disk-like pads of the feet are believed by A. Milne-Edwards to be employed as suckers, and to enable the animal to hold on to smooth rocks or stones in a stream-bed.

Suborder *DERMOPTERA*.

This suborder contains but a single family, represented by only one genus. The connexion with the Insectivora is not very obvious, and the view, already noticed, that the Dermoptera should rank as a distinct order has much in its favour.

Family GALEOPITHECIDÆ.

Genus **GALEOPITHECUS**, Pallas (1780).

It will be convenient to give all the characters of this anomalous mammal under the head of the genus. The flying lemurs, as they are called, are animals about the size of a small domestic cat, having a rather long head, well-developed tail, and slender limbs.

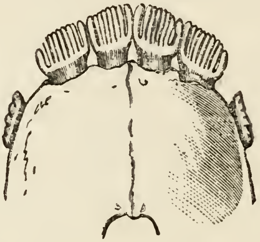

Fig. 70.—Lower incisors of *Galeopithecus*. (Guide to the Galleries of Mammalia, British Museum, 1885.)

An expansion of the skin connecting the limbs begins from the side of the throat, extends all along the neck, body, and tail to the tip, and forms a web between all the toes which are included in it to the base of the claws. The whole forms a parachute, by the aid of which the animal glides from tree to tree. Something similar is found in flying squirrels and in some other mammals and a few lizards, but in none is it so fully developed as in the present genus.

Dentition: i. $\frac{4}{6}$, c. $\frac{1-1}{1-1}$, pm. $\frac{2-2}{2-2}$, m. $\frac{3-3}{3-3}$. The upper incisors are quite at the side, all the terminal portion of the upper jaw being toothless. The anterior pair of incisors are compressed and subpectinate, with one root. The second incisor and the canine are similar to each other in shape, both being compressed and two-rooted, with a triangular crown terminating in a median point. Premolars and molars three-rooted. Anterior premolar with two principal cusps. Second premolar and all the molars similar in shape; the crown semioval in section, with the convex side inwards, and sharply tuberculate around a central hollow.

Lower incisors pectinate, the two median pairs very deeply cleft like combs; outer pair much less deeply cut. Lower canine and anterior premolar much like upper canine; second premolar elongate and tuberculate; lower molars very similar to the upper, but with the convexity towards the outside of the jaw.

Skull broad, muzzle rounded and blunt, rim of orbits projecting, postorbital processes broad, zygomata strong; palate terminating posteriorly in a median point, from which a ridge runs backwards in continuation of the narial septum and divides the mesopterygoid fossa. The bullæ are completely ossified.

The radius and ulna are united distally, the tibia and fibula distinct throughout. The vertebral formula is: C. 7, D. 13–14, L. 5–6, S. 5, C. 15–17.

The ears are rounded and of moderate size. The feet have a naked, very flat, non-tuberculate sole. Claws sharp, much compressed, and curved. Mammæ 4, all pectoral. There is a large cæcum.

This remarkable animal has been referred by different naturalists to the bats and lemurs; but it has really no affinity with the former, and but little with the latter, from which it is separated by the form of its brain, the structure of the skull and teeth, and the deciduate discoidal placenta.

Two species are known—one, *G. philippinensis*, peculiar to the Philippine Islands; and the original type, *G. volans*.

133. **Galeopithecus volans.** *The flying Lemur.*

Lemur volans, *L. Syst. Nat.* i, p. 45 (1776).
Galeopithecus volans, *Pall. Acta Acad. Sc. Petrop.* iv. p. 208, pls. vii, viii (1780); *Horsf. Cat.* p. 26; *Blyth, J. A. S. B.* xxi, p. 433, xxii, p. 411; *id. Cat.* p. 19.
Galeopithecus temminckii, *Waterhouse, P. Z. S.* 1838, p. 119; *Cantor, J. A. S. B.* xv, p. 177.
Kubong, Malay.

Fur short, very fine and soft. Canines and the outer upper incisor and first lower premolar with low crowns. Anterior upper incisors trilobate (sometimes with four lobes).

Colour above varying from dark greyish brown to pale chestnut, always overlaid, mottled, and blotched with silvery white; lower parts light brown, more or less rufous. Younger animal much variegated, and with well-defined white spots on the side. The dorsal fur is generally (not always) dusky at the base; the greater part of the length is whitish, a subterminal ring blackish brown (varying to chestnut), and the tip white.

Dimensions. A male measured, head and body 16 inches, tail 9. A skull is 2·75 inches long in basal, 2·9 in extreme length, zygomatic breadth 2.

Distribution. The Malay peninsula, extending north to Mergui in Tenasserim, where it was obtained by Capt. Berdmore, and to Siam, also Sumatra, Java, and Borneo.

Habits. This species is of course arboreal, and by means of its parachute can throw itself from one tree and glide through the air to another at a considerable distance. Wallace relates that he saw one pass from one tree to another 70 yards distant, with a fall of only one in five; and he remarks that the animal must

Fig. 71.—*Galeopithecus volans.* (From a drawing by Col. Tickell.)

have some power of guiding itself in the air, as otherwise it could not alight on the trunk of the tree to which its flight is directed. It is entirely nocturnal in its habits, and is said to remain hanging on the stem or branch of a tree head downwards during the day, its peculiar mottled coloration being very similar to that of the bark.

Galeopithecus is said to be purely herbivorous, feeding on leaves and fruits. It has but one young one at a time.